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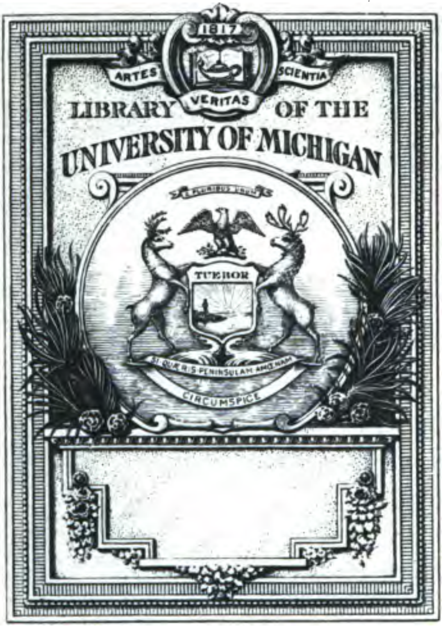
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lately given to her
daughter Frances
Sophia Fielding

Res valet, ars præſtat.
Si res perit, ars mihi reſtat.

D: Loggan fecit

UNIV. OF

# Lux Mercatoria
# ARITHMETICK
Natural and Decimal;

Digeſted into a more eaſie and exact Method for reſolving the moſt Practical and Uſeful Queſtions than hath been yet publiſhed.

WHEREIN

The moſt Critical Queſtions of Reduction, Trucks, and Exchanges of Monies, Weights and Meaſures of Forein Countries, from 5 Numbers to 13, heretofore wrought by 3. 4. 5. or more Operations in the Golden Rule, are now performed by one, and the Fractional parts thereof explained by the Monies, Weights and Meaſures of *England*, and made familiar to mean Capacities.

WITH

A Modeſt Examination of divers Rules formerly ſet forth by others, and a clear Eviction of their Errors and inſufficiency, as well in Decimal as Natural Arithmetick.

Whereunto are added

Tables computed for the Forbearance, Diſcompt, and Purchaſe of Annuities, Leaſes, and Penſions at 6 and 8 *l. per cent.* Intereſt for forty years.

By *NOAH BRIDGES.* Eſq;.—

Non ſibi ſed toti genitum ſe credere mundo.

LONDON, Printed by *R. I.* for *Thomas Johnſon* at the Golde
Key in St. *Pauls* Church-yard. 1661.

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MVP. 2-8-40

To the Right Honourable Sir *Edward Nicholas* Knight, Principal Secretary of State to his Moſt Excellent Majeſty, *CHARLS* the Second, of Great *Britain*, *France* and *Ireland*, King, and one of his Majeſties Moſt Honourable Privy Council.

May it pleaſe your Honour,

THe following Tract is deſigned for publick good, and ſo may probably be as laſting as I wiſh your Honours Name and

Memory. It was intended for your Honour in your abſence, with my duty in its innocence (I did not think upon your Honour with leſs Reverence for the diſtance of place) But the Artifices that were then upon mee to alter my Reſolution, and to efface your Honours Noble Name, and inſert a thing called Protector, were difficulties that withſtood my ſingular eſteem, and ſuch as could not be ſubdued but by time and patience; yet had the length of the late troubles exceeded the poor remains of my Hour-glaſs, it would have found your Honour, by that order I had taken, though *with a Dedication in Language of a different dreſs: I humbly confeſs I did therein reflect upon the general Afflictions of theſe three Kingdomes, and the Active Proſecutors thereof, but I have ſince learned limits which I ſhall not tranſgreſs. My ſervice owes particular duty to your Honours favour, by particular Engagement, and that I may eſcape the guilt of a defidious acknowledgement, I confeſs it to all the world. I was neer fourteen years out of your Honours ſight (your Honour was not ſo many hours out of my memory) yet at your return you were pleaſed to incourage mee to* *imploy that breath which I would have ſpent in expreſsions of gratitude, to beg your Honour to increaſe the Cauſes of it. I therefore beſeech your Honour to accept the tender of my duty in this ſmall Preſent, To grant that your Protection, and the Author your Pardon, with favourable permiſsion, to ſtile himſelf*

Your Honours Faithful,
Humble Servant,

Noah Bridges.

To thoſe deſirous to Learn.

I Have often obſerved, that many who have turned over ſeveral Tracts of Arithmetick, upon pretence of taking pains to attain the Art, run from the material parts thereof, and, to humour their fancies, ſquander time in trivial queſtions of taking up Eggs and Stones, and the like; For prevention whereof I have waved Progreſſion, ſports and paſtimes, inſerting only for Diverſion, Queſtions in the 5th. 14th. and 23th. chapters, which are uſeful and pleaſant. And (though I know it, will be heartily wiſht, I may incur his fate, who by humbling his Expreſſions to a mean Auditory, turn'd dunce) I have digeſted my Method in words (I hope) familiar to the meaneſt Capacities. I will not ſeriouſly ſay I am 30 years old in this Art, but (I may ſadly ſay) for above 12 years paſt I have been very converſant therewith, and the daily experience thoſe years have added to my firſt knowledge, I here freely communicate for the benefit of the Learner. The Affinity between this and my Tract of Vulgar Arithmetick is very little (unleſs in the Table of Reduction, and that of Practice, which either are or ſhould bee in all Books (that are books of this nature) The Copy of this contains above 20 ſheets more than the former, cloſer written, and the difference both in bulk and compoſure, will ſoon be apparent to thoſe that peruſe it, without prejudice. Poſſibly ſome may approve and commend, others quarrel and condemn the work, but I am indifferent (I expect no other reward than what's above mee) for fair words will not fan mee a wind, by which I can long ſail, and if the Wolf bark, his own breath will blow it away: Duty and Affection to my Patron, and the publick, are the hinges upon which I move, and therefore I ſhall onely ſay to Criticks and Cynicks, that if they like it, ſo, and, if not, ſo too.

Farewel.

Putney
June 10. 1660.

To

To my Worthy Friend
Mr. NOAH BRIDGES.

SIR,

Thoſe that Poetick Numbers as well know,
As you do others, may attempt to ſhow
Your worth in whole Arithmetick; and tell
How this all Arts, how You in this excel:
What Doubts reſolv'd, what Errors put to flight,
What new Diſcoveries made by your new Light.
Which (like the *Seſtian* Taper that once ſtood,
To guide *Leander* through the doubtful flood)
Conducts all Merchants, and through all that's hard,
Your Light's their Load-ſtar, and your Book their Card.
But though my Muſe be only Sympathy,
And true Affection my beſt Poetry.
Allow theſe worthleſs lines a place among
Thoſe nobler fancies, that your praiſe have ſung.
Though mine as ciphers, nothing ſignifie
Alone, but ſerve t' increaſe the company;
Yet but one cipher ſet to what's before,
Saies all that's there, yea and ſaies ten times more.
Mee thinks I ſee ſelf-condemn'd Falſhood look
Upon yours, as upon her Doomſday-book.
And every Science hope a reſcue from
The State of Nonage to perfection.

Since this ſo vaſt, beyond all [illegible] extent,
Hath now at laſt gain'd her full Complement.
Raiſ'd by your Travel up to a condition
Above Detraction, and beyond Addition,
As you have her, may ſhe again you raiſe,
Numbring your Golden Summs, as well as Daies.
And till that Daies and Numbers both ſhall ceaſe,
Your Fame like both, ſhall ſtill admit Encreaſe.

Fran. Reade.

Upon that learned and induſtrious Compoſure of the moſt difficult parts and queſtions in Arithmetick, by his Worthy Friend Noah Bridges, *Eſq;*

OLd *Records*, *Baker*, they whoſe reputation
Engroſs't this Kingdome, 'fore it was a Nation,
If now were living, might pack up, be gone
To Sea, or Pulpit, which refuſeth none.
Wee need no more, *Bridges* alone ſhall ſtand,
Clear light for Merchants, both at Sea and Land.
I croud for place, among thy friends from hence,
Whether next pounds, thy ſhillings, or thy pence:
Ambition 'tis, when on thy works I look,
To ſtand, though for a Cipher, in thy book;
Thy Book Arithmetick, ſo rarely wrought,
The like ſcarce ſeen; truly ne're truly taught.
Welcome thy learned Peece; now for amends,
Sit down hereafter, and compute thy Friends.

George Tinrey.

To

To the moſt ingenuouſly accompliſhed Mr. Noah Bridges, *upon that his moſt Excellent Peece of Arithmetick, entituled* LUX MERCATORIA.

IF ſome grave Sages have not judg'd amiſs,
The Soul of Man compoſ'd of number is:
No wonder then if juſtly wee confeſs
Arithmetick the Soul of Sciences.
And of that Soul wee do aſcribe as due
The intellective faculty to you.
Not onely ſo; (onely to underſtand,
And not communicate with liberal hand,
Art's precious Myſteries, were to engroſs
A Treaſure to an univerſal loſs.)
But you are Practick too; and do diſpence
To groſſer ſpirits, Light and Influence.
So Diamonds with greater luſtre ſhine
Enchaſ'd in Gold, than in their Native Mine.
Your Light is ſet upon the Candleſtick,
And clearly ſhines in your Arithmetick:
New Lights indeed wee had enough before,
Wee'l hardly thank him that diſcovers more;
Poor glimmering Lights, that for a while did blink,
And afterwards expir'd into a ſtink.
But this your work exceeds thoſe things, as far
As the bright Sun out-ſhines a falling-Star;
And may it alwaies ſhine, and ſo out-vye
Phœbus himſelf in perpetuity;

May it, as it deſerves, keep warm the Preſs,
And fill it with Editions numberleſs.

Ἑαυτὸν Ἀριθμήσας, Κόσμον καὶ πείρατα γαίης
Μετρεῖς, τῆς ἄμμου καὶ τὸν ἀριθμὸν ἴδες.
Εἰσι μὲν οἱ πρότεροι, Οὐδ' ἐν λόγῳ, ἀλλ' ἐν Ἀριθμῷ
Σὺ προέχεις πάντων, ὅσσοι ἔασι, βροτῶν
Ἀσφαλέας παρέχεις τοῖς Ποντοπόροισι ΓΕΦΥΡΑΣ
Τεχνῶν Ἥλιος καὶ ΦΑΟΣ ἘΜΠΟΡΙΗΣ.

J. C.

To the moſt Ingenuous Author of Natural and Practical Arithmetick, Noah Bridges *Esq.*

TAke my wreath too, and crown thy ſtudious Brows,
These are not *Daphne's*, but *Thalia's* boughs;
Whereof were I an Artiſt, I might make
What I would give, and you deſerve to take.
And what are your deſerts? Sir, ſurely ſuch,
No praiſe can bee enough, no Meed too much.
But Virtue is its own Reward, and none
A Herald wants, that is, like you, his own;
Nor is there need of this, your own things be
Your Book, your Poem, and your Eulogie.
Others, 'tis true, this Art have well deſign'd,
But your more curious hand polliſh'd, refin'd:
You this rough knot, with which old Students ſtriv'd,
Have to a ſtately Mercurie contriv'd.
Seek wee what Nature was, before the fall?
Shee's here protray'd the ſame, Numerical;

Your clear enfranchiſ'd Genius ſubtly pryes
Into the ſeeds of her Exiſtencies.
Seek wee choice Rules of Practice, you rehearſe
Such as were uſ'd, to build the Univerſe:
Never was Number, Weight, and Meaſure ſcann'd
So well before at any mortal hand.
Nor is your Guerdon ſmall, for having ſpent
Your oyl and ſweat, you've built your Monument;
This Book, which ſhall both State and fate controul,
And be as laſting as the Artick Pole.

Tho. Mayhew.

To my very much honoured Friend Noah Bridges *Eſq;* *on his exact and moſt refined Peece of Arithmetick,* *entituled* LUX MERCATORIA.

IN ſuch a Throng as this not to come in,
And do my Duty, doubtleſs were a ſin:
How fearful am I, though, leſt I prove more
Your Enemy, than Friend upon that ſcore?
Bad lines a meritorious Work diſgrace,
As much as daubing doth a comely face:
Yet let mee paſs upon't, and truly ſay,
Before your Light, wee had no perfect Day.
Arithmetick the Art, doth ſeem to bee
Of the Great Three-in One, and One in Three.
In Number, Weight, and Meaſure, all was fram'd
That *Solomon* ere knew, or *Adam* nam'd.
The Pſalmiſt rightly thought that Wiſdomes waies
Chiefly conſiſt in numbring out our daies.

How much are wee indebted to your Light,
Which clearly teaches how to number right?
Hee that would number all the praiſes due
Into your Work, muſt learn the Art of you,

W. Coles.

To his much Honour'd Friend Noah Bridges *Esq; upon his new and moſt exquiſite Peece of Arithmetick.*

NOw do wee ſee what ne're before was wrought,
An Art, unto it's full perfection brought;
It is thy work great *Bridges*, and doth claim
A nobler praiſe than I can give thy Name;
Nor let the Vulgar ſpirits idly dream,
That theſe thy works were onely pend for them,
Since on the *Baſis* of thy Art are rear'd
All other Arts, by men the moſt preferr'd;
For by thy Aid Divine Aſtrology
Reveals the ſecret Myſteries of the sky,
What, can ſhe therefore leſs than place thee there?
Whoſe merits no place can fit, unleſs a ſphear?
Thou mak'ſt the ſounds of Muſick to agree
In ſweet and due proportion'd melody;
What can ſhee therefore leſs than tune the ſphear,
Where thou muſt ſhine, and thy Encomiums hear?
Proud Architecture, Quaint Geometry,
Like Hand-maids wait upon thy Art and thee;
Nor could wee rightly thy own praiſe rehearſe
Without thy help, ſince thou doſt give to Verſe

Number and feet, and while the Merchants quill
By thy inſtructions doth his Folio's fill;
Juſtice doth ſeem maintained by thy Aid,
While mine and thine in thy true ballance weigh'd
All men receive, as thou doſt judge them due;
Let all men then that do thy Labours view,
With gratitude upon them ever look,
Reſpecting thee, and honouring thy Book;
But let them know they'l bee thy debtors yet,
Till thou haſt taught them how to pay the debt;
For what Arithmetick can count thy merits
Unleſs thy own, whoſe every Rule inherits
Such a perfection, that wee may conclude,
Yet to the holy Text be nothing rude,
That God taught numbring firſt, but did decree
That none ſhould live to teach it after thee.

J. Phillips.

* * *

To his Honoured Friend Noah Bridges *Eſq; upon his New and Excellent Peece of Arithmetick.*

WHat though our place be loſt! I ſay proceed,
Egregie Doctus doth no Tryers need:
Let theſe few Staffs be to thee as my ſtick,
Go forth then Doctor of Arithmetick.
In thy firſt work, thou didſt thy exerciſe,
This is thy Act, and thy Solemnities.
What Grammar cannot beyond * three decline
Caſes of Number, in this work of thine

** A tribus ad centum Aptota.*

Exceed e'ne thoſe of Law; we cheaper may
Try theſe, than thoſe too, and our Maſter pay
I in theſe numbers do thine own require
Thoſe that have not, may what they're willing, write.
Merchants, do you the reſt (for truth I can't)
Give Numbers Numerate for Numerant.

Perge Liber, ſaltem Scriptoris Nomine fœlix;
Binus nam præſtans Orbe Noachus erat:
Ille prior, mundus reparatur, perditus undâ,
Et tu qui numeras, Tempore longa brevi:
*Ne ſint Pontifices olim * Ratione ſuperbi,*
Cedunt Pontifices Pontibus: Ara tua eſt.

* *Scilicet Computo Romano.*

E. G.

To

To the highly deſerving Noah Bridges, *Eſq; (my Honoured Friend) upon his Elaborate and moſt Ingenuous work, intituled* LUX MERCATORIA.

IF former *Merits* from the higher *Power*,
Inſtead of raiſing, have depreſt thee lower;
And th' heedleſs *Stars*, by partial *Influence*
Have given meaner *things* the Preference,
Which the deſerts of thy right *Loyal* Soul
Might in all juſtice challenge *ſans* controul;
'Tis *Fate*, no *Fault* of thine, nor any other,
But ſuch as ſeek true *Virtue* ſtill to ſmother:
Rouze up thy *Spirits*, then, be not diſmay'd
For *Nobles* now, as well as *Merchants* trade;
It is not, *What haſt done? How doſt thou live?*
The general *Quare*'s now, *What canſt thou give?*
Therefore the *Court* and *Exchange* joyntly are
Beholding to thy induſtry and care,
For publiſhing this Peece, whoſe real worth
No Encomiaſtick Verſes can ſet forth;
This onely may be ſaid in thy due praiſe,
Noah's the *Miroir* of our Modern daies;
Miroir for *Money-Mongers*, and the reſt,
Whoſe grandeſt *Principle* is *Intereſt*.
For, all their former Rules were dark as night,
Till thy *Lux Mercatoria* gave them light.

J. Wright.

To my ever Honoured, and moſt Ingenious Friend, Noah Bridges *Eſq; on this his Excellent Work, intituled* LUX MERCATORIA.

I'M none of thoſe that *Well-done* alwaies cry,
To cheriſh favour, or ſend *Fools* to *buy*,
But one (thou know'ſt) *ſurveighs* thy *skill* and *pains*,
Before I *Emulate* thy pregnant *Brains*;
Brains that have purchaſ'd *Fame*, and *Love* enough,
Yet get they neither *Pantaloons*, nor *Muff*.
Ungrateful Age! yeelds onely *Words* to charm
Thy *Teeming-mind*, but nought to keep thee *warm*.
But *Arts* have *Flame* ſufficient, againſt *Cold*,
And (which is much) are neither *bought* nor *ſold*.
Beſides, (if my *Philoſophy* hit right)
Here wants no *Heat*, to wait on this thy *Light*;
Which *Night-exiling-luſtre* let's us ſee,
Thy *Growth* is not in *Years*; but *Induſtry*.
That *Induſtry* ſo boundleſs, no man dares
With thee *Vye* either *Well-ſpent Hours*, or *Ware*;
Ware fit for *Merchants* (which are ſo for it)
Indeed for all, that deal in *Coin* or *Wit*.
Then let ſuch take it; hee laies claim to neither,
Whoſe *Trading* moſt conſiſts in *Wind* and *Weather*

G. Wharton.

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THE

Stationer to the Reader.

Reader,

I Think it fit to let thee know, that in printing this Book, I found the Author to hint many Tracts of Arithmetick, wherein hee confutes ſeveral Rules and Queſtions, and yet hee only ſpeaks thoſe Tracts to be printed in ſuch and ſuch years, without any Nomination of the Authors, by which general intimation I conceive the Learner could not (there having been ſeveral Editions of thoſe Tracts) underſtand how to ſhun thoſe Rules which have already been ſo prejudicial, and therefore I have imployed other hands to ſearch out thoſe Books wherein the Rules and Queſtions are ſo confuted, and (without the Authors conſent or privity) I have in ſeveral pages of this work named as many of the Tracts, or Authors of them, as could bee found to preſerve thee from error.

Farewell.

CHAP. I.

Of Notation of Numbers.

1 TO number is to expreſs the value of a ſumme propounded.

2 Numbers are expreſſed by letters or figures.

1 By figures thus,

One ---	1
Two ---	2
Three ---	3
Four ---	4
Five ---	5
Six ---	6
Seven ---	7
Eight ---	8
Nine ---	9
Nothing ---	0

Theſe nine are ſignificant figures of themſelves, the little circle or cipher repreſented by the letter (o) ſignifies nothing, yet increaſeth the value of a number, according to its place or poſition, as is evident by the following Table.

A Table of Notation.

Degrees				Degrees
1	1	One, or Unites	1	1
2	10	Tens	21	2
3	100	Hundreds	321	3
4	1000	Thouſands	4321	4
5	10000	Ten Thouſands	54321	5
6	100000	Hundred thouſands	654321	6
7	1000000	Millions	7654321	7
8	10000000	Ten Millions	87654321	8
9	100000000	Hundred Millions	987654321	9

To expreſs the value of a number.

3 Hence obſerve, That *to expreſs the value of any number, you are to begin at the right hand, and reckon toward the left, as Unites, Tens, Hundreds, Thouſands, &c.*

For by this Table you ſee the figures by degrees do increaſe by Tens, proceeding from the right hand towards the left, in value according to their places. Example,

The ſiniſter or left hand Table.

4 *The Table on the left hand begins with an Unite, unto which annexing a Cipher, the ſecond degree will bee Ten, that is in value* 10 *times the firſt: Unto that annex another Cipher, and then in the third place, it is an hundred, that is,* 10 *times greater than the ſecond degree; The fourth place a Thouſand, that is,* 10 *times greater than the third, &c.*

The right hand Table.

5 *The ſecond or right hand Table begins with an Unite, before that towards the left hand is placed* 2, *which being in the ſecond degree makes Twenty; ſo both the figures, Twenty One. In the third,*

third place, Three Hundred Twenty One, as will more plainly appear by what follows.

1	One.
21	Twenty one.
321	Three hundred twenty one.
4321	Four thouſand, three hundred, twenty one.
54321	Fifty four thouſand, three hundred twenty one.
654321	Six hundred fiftyfour thouſand, three hundred twenty one.
7654321	Seven millions, ſix hundred fifty four thouſand, three hundred twenty one.
87654321	Eighty ſeven millions, ſix hundred fifty four thouſand, three hundred twenty one.
987654321	Nine hundred eighty ſeven millions, ſix hundred fifty four thouſand three hundred twenty one.

6 Hence obſerve, that *to pronounce any number, you are to begin at the left hand, and read towards the right, which you may do after another manner, more (eaſily) thus.*

To pronounce a Number.

7 *Prick the fourth figure, and afterwards every third figure from that, and for every prick pronounce thouſand*, as in the following Examples.

123456789, One hundred twenty three thouſand thouſand, four hundred fifty ſix thouſand, ſeven hundred eighty nine.

987654321, Nine hundred eighty ſeven

thouſand thouſand, ſix hundred fifty four thouſand, three hundred twenty one.

91359684, Nine hundred and thirteen thouſand thouſand, fifty nine thouſand, ſix hundred eighty four.

8 *Numbers are divided into Digits, and Articles or Decimals, and compounded of both.*

Compound Numbers	*Articles or Decimals*	*Digits*
	10	1
1234	20	2
5678	30	3
9012	40	4
3003	50	5
4567	60	6
2101	70	7
3507	80	8
7080	90	9
	100	

By Letters thus.

1	I
2	II
3	III
4	IIII or thus IV
5	V
6	VI
7	VII
8	VIII
9	IX
10	X

Hee that is to bee qualified for Merchandizing, or any other eminent way of Trading, ought to be able to underſtand and write the letters in the left hand Table, as well as the figures:

11	XI
12	XII
18	XVIII
19	XIX
20	XX

The reaſons for his ſo doing, (which cannot conveniently bee here inſerted) will appear when hee comes to be converſant with a waſte book, Journal or Lidger, but the numbers in the right hand Table are ſeldome uſed, unleſs by Gravers, Stone-cutters, &c.

The reſpective places and values of the letters on the right hand are explained by the figures on the left.

21	XXI			
25	XXV	300	CCC	
30	XXX	400	CCCC	
40	XL	500	D. or thus IↃ.	
49	XLIX	600	DC. or thus IↃC	
50	L	700	DCC. or thus IↃCC	
59	LIX	1000	CIↃ or thus M	M
60	LX	2000	CIↃ CIↃ or thus	2
70	LXX	3000	CIↃ CIↃ CIↃ	
80	LXXX	5000	IↃↃ	
89	LXXXIX	10000	CCIↃↃ	
90	XC	50000	IↃↃↃ	
95	XCV	100000	CCCIↃↃↃ or thus CM	
100	C	500000	IↃↃↃↃ	
200	CC	1000000	CCCCIↃↃↃↃ	
		1660	CIↃDCLX or MDCLX	

CHAP. 2.

Of Addition of Integers, that is of whole things that conſiſt but of one Name or Kind, as Pounds of Mony, Pounds of Weight, Ells, Yards, and the like.

Addition of Integers.

1 *ADdition is the gathering together, and bringing divers numbers into one whole or groſs ſum.*

2 *Place the numbers ſo, that the like degrees may ſtand in the ſame rank, that is, Unites againſt Unites, Tens againſt Tens, and Hundreds againſt Hundreds, &c.*

When the numbers amount not to 10 in any rank.

3 *When you are to add two, or more numbers together, if in the adding of them they amount not to Ten, you are to proceed as followeth, viz.*

Thouſands	Hundreds	Tens	Unites
1	2	3	4
4	3	2	1
1	3	1	0
3	0	2	4
9	8	8	9

Now a line being drawn underneath, you will finde the firſt row makes nine, ſet that down directly againſt the firſt place of Unites.

The ſecond row makes eight, which ſet down againſt the ſecond place, the place of tens.

The third row makes eight, which ſet down againſt the third place, the place of hundreds.

The fourth row makes nine, which ſet down againſt the fourth place, the place of thouſands, and the groſs or whole ſumme is found nine thouſand, eight hundred, eighty nine.

4 *When the ſum of the Figures of any of the Ranks amounts to Ten, place down under the ſame Rank a Cypher, but when it exceeds Ten, place down under the ſame Rank that Number which is over and above Ten, and for every Ten, Article, or Decimal, carry one in mind, and adde it to the Figures of the next Rank towards the left hand.* So,

When the numbers amount to 10, or more, in any rank.

Five thouſand one hundred twenty three, 5123
Three hundred twenty one —— 321
Thirteen —— 13
And twenty three —— 23
being to be added together, the ——
total is Five thouſand, four 5480
hundred and eighty ——

The firſt Rank make Ten, I ſet down a Cipher, and for that Ten, carry one to the next place, which makes
The Second Rank eight,
The Third Rank is four,
The Fourth five.

So the numbers four thouſand, ſix hun-

dred and ſeven ———— 4607
Eight thouſand ſix hundred twenty eight. ———— 8628
Six thouſand eight hundred forty five-6845
And three thouſand one hundred and thirty ——— } 3130

Being given to be added together, the operation will ſtand as in the Margent, and the total will be ——— 23210

The figures in the firſt rank making 20. ſet down (0) exactly under the ſame rank (there being nothing over and above 20) and for the two Tens, carry 2 to the next place; thoſe in the ſecond Rank with the 2. carried making 11. ſet down 1. and carry 1. to the third place; the third Rank with the one you carried making 22. ſet down 2. and carry 2. to the 4th. place; the two carried, and the figures in the 4th. Rank making 23. ſet down 3. and becauſe the 2. in mind cannot be carried to another rank (the work being finiſhed) ſet that 2. a place toward the left hand beyond the 3. and the whole ſumme is twenty three thouſand two hundred and ten. And the like method is to be obſerved in the following and all other examples.

35432

35432	73209	65489
70358	78698	73598
73589	79978	73589
65439	79898	89753
90000	73029	65489
4520	3030	73200
319	231	5000
339657	388073	446118

5 To adde theſe Summes together; the uſual way is to ſay, 9 and 9 make 18, and 18 and 9 makes 27, &c. which is a dull drailing way, and therefore obſerve this order. Caſt your eye upon the firſt rank and ſay (without noyſe) nine, eighteen, twenty ſeven, thirty five, thirty ſeven, then place down ſeven and proceed to the ſecond rank, and (becauſe you are to put the 3 in mind which you carry for the 3 Tens that are in thirty to the firſt figure of one) ſay four, ſix, nine, ſeventeen, twenty two, twenty five, then ſet down five and bear two in mind, and ſo proceed to the end; you may, when you are perfect in adding the former Numbers, take two or three Figures or more together with eaſe, and ſo proceed more readily and ſpeedily.

See the firſt of the three laſt examples.

Example.

1 Now at the firſt rank you may ſay, 12, 20, 36.	735908
2 At the ſecond - 3	735908
At the third - 13, 20, 38	325708
At the fourth - 12, 28, 27	787509
At the fifth - 12, 18	902803
At the ſixth - 10, 20, 34	3487836

which is done by taking two or more figures in your eye at once; but it is not amiſs to obſerve the eaſieſt method firſt, and to forbear the laſt until you are very expert in this kind of Addition, which will be made more familiar to you by the following Examples.

730808	73540	62145
350809	30745	56839
100890	70354	45678
733321	30758	12345
583578	50875	31245
738567	60787	21345
543210	70735	78912
857890	80357	34567
978799	70358	89101
978978	73589	98765
978998	98350	43210
735432	98350	67891
212345	98390	20305
8023605	907188	662348

The firſt Rank makes 65 ſet down 5, and for the 6 tens, carry 6 to the ſecond rank, with which the ſecond Rank makes 70 ſet down a Cipher, there being no overplus, and for the 7 tens carry 7 to the third place, &c.

See the firſt of the three laſt Examples.

Several ſummes of mony are owing by ſeveral perſons, &c. viz.

The firſt owes ſeven thouſand three hundred twenty three pounds	7323
The ſecond eight hundred ninety two	0892
The third ſeven hundred and ſixty	0760
The fourth ſeventy nine	0079
The fifth thirty eight	0038
The ſixth one hundred and eight	0108
The ſeventh two hundred and three	0203
The eighth ninety three	0093
They all owe nine thouſand four hundred ninety ſix pounds	9496

which you may read thus; nine, four, nine, ſix.

6 Addition of Integers may bee proved thus, viz. draw a line as in the Margent, that done caſt away all the nines in the ſeveral ſummes given to bee added, and ſet the remainder at one end of the line, then caſt away the nines from the total and ſet the remainder at the other end, and if both

73589
93989
73508

both remainders agree the operation is right as in the margent.

241086

Proof 3 - 3

See the proof of Addition of divers denominations in this Chapter, after which order, this proof may be otherwiſe made if the learner pleaſe.

Of the Addition of Numbers of divers names or kindes

THe Coins that are moſt commonly uſed in *England*, are Pounds, Shillings, Pence, and Farthings.

Thus Charactered.

l. Signifies pounds
s. Signifies ſhillings
d. Signifies pence
f. or *q.* ſignifies farthings.

4 Farthings make a penny.
12 Pence make a ſhilling.
20 Shillings make a pound.

1 *In Addition of Numbers of divers names or kinds, you are to place all numbers of the ſame name or kind one under another, as firſt, pounds under pounds, ſhillings under ſhillings, next pence under pence, and laſt farthings under farthings, then draw a line under them, and begin your Addition with the leaſt kind firſt, namely Farthings, and for every four farthings bear a penny in mind to bee carried to the place of pence, and for every ſhilling (or twelve-pence) bear one in mind to bee carried to the place of ſhillings, and for every*

twenty ſhillings bear one in mind to be carried to the place of pounds, and in the place of pounds obſerve the order of adding Integers, and for every ten carry one to the next place.

If there be any odde farthings, remember to ſet them down under the rank of farthings.

If any odde pence, ſet them under the rank of pence.

If any odde ſhillings, ſet them under the rank of ſhillings.

Let the Numbers added together be, *viz.*

	l.	*s.*	*d.*	*q.*
forty three pounds thirteen ſhillings eight pence three farthings ---	43	13	08	3
Forty nine pounds nineteen ſhillings nine-pence farthing ---	49	19	09	1
Sixty ſeven pounds nine ſhillings eleven pence half-peny ---	67	09	11	2
Thirty eight pounds eighteen ſhillings ten pence --	38	18	10	0
Twenty two pounds ſeven ſhillings eight-pence three farthings ---	22	07	08	3
Sixty nine pounds nineteen ſhillings ſeven pence half-peny ---	69	19	07	2
	292	09	07	3

Now proceed according to the Rule, and you find the ſeveral ſummes added to be,

I Two

Two hundred ninety two pounds, nine ſhillings, ſeven pence, three farthings.

Which you may more readily read thus:

Two hundred ninety two, nine, ſeven, three.

Several ways are uſed in this kind of Addition, ſome make ſo many pricks as there are pence, ſhillings, or pounds to bee carried from rank to rank; others gather all the pence together, and then (if they can) find how many ſhillings are in the pence, which way is more tedious than the other.

The following Table would help a weak head to the finding out of the ſhillings in any number of pence in twenty ſhillings, but I do not inſert it becauſe I have any kindneſs for that way, but becauſe it may be uſeful to the learner in another kind.

The Table.

d.	s.	d.
20	1	8
30	2	6
40	3	4
50	4	2
60	5	0
70	5	10
80	6	8
99	7	6
100	8	4
120	10	0
140	11	8

d.	s.	d.
160	13	4
180	15	0
200	16	8
240	20	0

This Table is ſo eaſie, it needs no explanation, for if a mean capacity ſhould ſtumble at it, hee would finde

20 pence to be one ſhilling 8 pence.
30 pence to be two ſhillings 6 pence.
40 pence to be three ſhilling 4 pence, &c.

But that I may ſhew you the way, which in my apprehenſion is beſt, for the orderly adding of numbers of divers kinds together, I again ſet down the former ſums, and

l.	s.	d.	q.
43	13	08	3
49	19	09	1
67	09	11	2
38	18	10	0
22	07	08	3
69	19	07	2
292	09	07	3

At the rank of farthings, ſay Two, five, ſeven, eight, eleven, then ſet down 3, and carry 2.

At the rank of pence, ſay Nine pence (adding the 2 I carried to 7) one and five pence, two and three pence, three and two pence, three and 11 pence, four and 7 pence, then ſet down 7 and carry 4.

At the rank of ſhillings, I ſay (adding the 4 I carried to 9) 13. 20. One pound 8, one pound 17, two pounds 6, two pounds 9, then every figure of one on the other ſide in the

the rank of ſhillings being an Angel, I put 2 of them together for a pound, and ſay, three pounds, four pounds, then ſet down 9, and carry 4, and proceed as in the Addition of Integers.

When practice hath made you familiar with this Rule, you may for more ready and ſpeedy working, take two or more figures together in your eye at a time, as was taught in Addition of Integers, *viz.* in the rank of farthings in the laſt Example you may ſay, 5, 11, inſtead of 2, 5, 7, 11, &c.

Other Examples will yet make this Rule more eaſie.

The rank of farthings in the firſt operation, make 6 pence and 2 farthings, the odd farthings ſet down under the rank of farthings, and carry 6 pence to the place of pence, which added to the rank of pence, make 8 ſhillings 6 pence, the 6 pence ſet under the rank of pence, and carry 8 ſhillings to the place of ſhillings, which added to the place of ſhillings, make 9 pounds, there being no odd

l.	*s.*	*d.*	*q.*
730	18	10	2
559	10	10	3
690	18	11	2
730	19	10	3
530	15	07	2
650	00	03	0
000	18	06	2
503	00	09	0
698	12	00	2
350	15	05	3
000	16	00	2
780	18	09	3
789	00	07	2
300	13	09	0
9	8	6	
7318	00	06	2

ſhillings remaining under the rank of ſhillings, ſet down one or two ciphers, and carry 9 pounds to the place of pounds, and then proceed as in Addition of Integers, and for every ten carry one to the next place, and you will finde the ſum, ſeven thouſand three hundred and eighteen pounds ſix pence half-penny, which you may read thus, ſeven thouſand three hundred and eighteen, nought ſix two, Or, 7. 3. 1. 8. 0. 6. 2. Seven, three, one, eight, nought, ſix, two.

And to help your memory, when the particulars to bee added are very large, you may ſet at the end of the rank of pence, ſo many pence as you carry from the rank of farthings in a ſmaller character.

And at the end of the rank of ſhillings, ſo many ſhillings as you carry from the rank of pence.

And at the end of the rank of pounds, ſo many pounds as you carry from the place of ſhillings, as in this and the laſt Example. And

Obſerve, that in adding together *l. s. d. q.* the odd farthings in the rank of farthings, if the operation bee well performed, cannot exceed 3, becauſe 4 farthings make a penny. Obſervation.

The odd pence in the rank of pence, cannot exceed 11, becauſe 12 pence make a ſhilling.

lb.	*s.*	*d.*	*q.*
908	19	11	3
898	10	10	3
809	18	01	1
708	00	00	0
310	10	10	0
508	10	02	0
799	10	00	0
3	2	0	
4943	19	11	3

The odd ſhillings in the rank of ſhillings, cannot amount to more than 19, becauſe 20*s.* make a pound as in the Example in the Margent, and from thence you may likewiſe obſerve for the reaſons aforeſaid, that if you ſet down any numbers to practiſe this kind of Addition in order to the making of your ſelf perfect therein, you are not at any time to ſet down more than 19*s.* in the place of ſhillings, nor 11 pence in the place of pence, nor above 3 farthings in the rank of farthings, which that you may yet the better underſtand, the following Examples are ſet down for your imitation.

Other Examples for practice and Proof.

Proof of Addition of divers Denominations

For Proof, cut off the uppermoſt number with the daſh of a pen, and add the Remainders into one ſum, then add the ſum of the Remainders, and the ſum cut off together, and that ſum will equal the total.

735

	l.	*s.*	*d.*	*l.*	*s.*	*d.*
	735	13	5	704	03	07
	839	19	7	300	04	09
	753	16	7	703	13	11
	323	12	8	805	15	07
	720	17	7	607	17	11
	350	14	3	503	15	07
	750	16	8	600	10	08
	350	13	7	305	15	07
	6	4		4	5	
Total	4826	04	4	4531	17	07
Total of the Remainders	4090	10	11	3827	14	00
Total	4826	04	4	4531	17	07

Addition of Troy weight.

By this weight is weighed, Bread, Gold, Silver &c. The uſual names or kinds of this weight, are

Pounds, Ounces, Penny-weights and Grains, of which

24 Grains make a Penny-weight,
20 penny-weight make an Ounce,
12 Ounces make a Pound, which are thus noted.

gr. ſignifies Grains.
dwt. Penny-weights.
℥ or *oz.* or ℥ Ounces.
lb. Pounds.

In the former Addition 4 farthings made a penny, and 12 pence made a ſhilling, and 20*s.* a pound, and therefore for every 4 farthings, a penny was carried to the place of pence, and for every 12*d.* a ſhilling, to the place of ſhillings, and for every 20*s.* a pound, to the place of pounds.

So in this, becauſe 24 *gr.* make a *dw.* and 20 *dw.* an ℥, and 12 ℥ a *lb.* for every 24 *gr.* I carry a *dw.* to the place of *dw.* and for every 20 *dw.* an ℥, to the place of ℥, and for every 12 ℥ a *lb.* to the place of *lb.*

Example.

Troy Weight.

lb.	℥.	*dw.*	*gr.*
9	06	12	06
7	09	09	13
8	05	10	02
7	03	11	13
6	04	05	18
9	11	19	03
49	05	08	07

Place the numbers as in Addition of mony, each under other, according to their ſeveral names or kinds, as in the Margent, then draw a line, and begin your Addition with the leaſt name or kind firſt, and in the rank of *gr.* becauſe you finde ſo many *gr.* as make 2 *dw.* and 7 *gr.* ſet down the 7 *gr.* under the rank of *gr.* and carry 2 to the rank of *dw.* with which the *dw.* make 3 ℥, 8 *dw.* ſet down the 8 *dw.* under the rank of *dw.* and carry the 3 ℥ to the place of ℥, with which the ℥ making 3 *lb.* and 5 ℥, ſet down the 5 ℥, and carry 3 *lb.* to the place of *lb* which added thereto make ——— 49 *lb.* 5 ℥. 8 *dw.* 7 *gr.*

And obſerve, that in ſetting down any numbers of this nature for practice, you are not to ſet down above 23 in the rank of *gr.* above 19 in the rank of *dw.* nor above 11 in the rank of ℥.

Other Examples for Practice.

lb.	℥	*dw.*	*gr.*	*lb.*	℥.	*dw.*	*gr.*
37	11	19	23	32	11	19	23
70	00	10	11	50	10	08	07
30	10	09	09	40	00	10	00
33	00	08	00	20	10	00	10
50	10	11	10	10	00	18	08
00	11	00	08	12	03	03	07
70	00	10	00	30	04	00	00
3	3	2		3	3	2	
329	09	09	3	197	05	00	07

90

Addition of Averdupoize Little weight.

This weight is diſtinguiſhed into Drams, Ounces and Pounds, which are thus noted.

dr. Signifies Drams ℥ Signifies Ounces *lb.* Signifies Pounds	16 *dr.* make an ℥. 16 ℥ make a *lb.*

By this weight are weighed Sugar, Pepper, Cloves, Mace, Nutmegs, Cynamon, and all ſorts of wares or Merchandize that are garbleable, that is, out of which iſſue a refuſe or Waſte.

Examples of Addition of Averdupoize Little weight.

lb.	℥.	*dr.*
12	11	15
07	08	09
06	07	03
10	10	10
08	12	13
46	03	02

Averdupoize Little Weight.

For every 16 *dr.* carry an ℥ to the place of ℥, and for every 16 ℥ carry a *lb.* to the place of *lb.*

Other Examples for Practice,

lb.	℥.	*dr.*
10	10	11
12	09	07
13	08	12
14	10	09
13	07	08
14	08	09
15	09	09
13	08	00
4	4	
103	09	00

lb.	℥.	*dr.*
21	12	08
32	11	07
33	10	09
39	00	08
40	10	12
50	10	13
51	11	14
52	10	15
5	5	
323	03	06

Addition of Averdupoize Great weight.

By this weight are weighed all Commodities sold by the Hundred, as Fleſh, Butter, Cheeſe, Wooll, Tallow, &c. And the hundred weight, which containeth 112 *lb*, is divided into Quarters, Pounds, and Ounces, which weights are thus noted.

C Signifies an hundred.
qu Quarters.
lb. Pounds.
℥ Ounces.

4 Quarters make a C
28 *lb*. make a *qu*.
16 ℥ make a *lb*.

Example.

For every 16 ℥ carry a *lb* to the rank of *lb*. for 28 *lb*. a *qu*. to the rank of *qu*. for 4 quarts a C. to the rank of hundreds.

C.	*qu*.	*lb*.	℥.
32	3	20	09
15	2	00	07
16	3	13	00
15	2	10	07
13	3	11	09
14	2	08	12
15	0	07	09
124	1	16	05

Averdupoize Great Weight.

Other Examples for Practice.

C.	*qu*.	*lb*.	℥.
33	2	27	15
32	3	07	13
30	0	10	10
50	3	05	06
6	3	01	05
00	3	00	10
		3	
211	3	25	11

C.	*qu*.	*lb*.
73	0	23
33	3	00
00	3	07
40	0	08
50	3	07
60	3	08
259	1	25

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res by the
ard and Ell.

In adding of the Meaſures of Cloth ſold by the Yard, Quarter, and Nail, becauſe 4 Nails make a quarter, and 4 quarters a yard, for every 4 nails carry a quarter, and for every 4 quarters a yard; And in Meaſures ſold by the Ell, for every 4 nails carry a quarter, and for every 5 quarters an Ell.

I might further proceed to Examples of Addition of liquid Meaſures, Dry Meaſures, Long Meaſures, Time, Motion, &c. but the Agreements of one kind with another, being to bee known by the following Tables, I conceive thoſe Tables, and the Directions upon them, cannot but be ſufficient for the meaneſt capacity.

Weight.

A *Table of Weight.*

1 Grain	Weight makes	1 Grain.
24 Grains		1 Penny-weight.
20 Penny W.		1 Ounce *Troy*.
12 Ounces *Troy*		1 Pound *Troy*.
14 Ounces 12 *dw. Troy.*		1 Pound Averdupoize, which is 16 ℥.
28 Pound Averdupoize		1 Quarter of an Hundred.
56 Pounds		1 Half Hundred.
112 Pounds		1 Hundred.
5 Hundred		1 Hogſhead.
10 Hundred		1 Half Tun.
2 Hundred		1 Tun.

The ſeveral Examples of Addition of Weight, are manifeſted by this Table, and the Table by them, and therefore neither the one nor the other need any further explanation.

Of Liquid Meaſures.

Liquid Meaſures are thoſe in which all kind of Liquid ſubſtances are meaſured.

1 Pound of Wheat *Troy* weight	makes	1 Pint.
2 Pints		1 Quart.
2 Quarts		1 Pottle.
2 Pottles		1 Gallon.
8 Gallons		1 Firkin of Ale, Sope, Herring.
9 Gallons		1 Firkin of Beer.
10 ½ Gallons		1 Firkin of Salmon or Eeles.
2 Ferkins		1 Kilderkin.
2 Kilderkins		1 Barrel.
42 Gallons		1 Tierce.
63 Gallons		1 Hogſhead.
2 Hogſheads		1 Pipe or But,
2 Pipes or Buts		1 Tun.

V. 12. *Hen.* 7. *cap.* 5.

Liquid Meaſures.

In

In Addition of Liquid Meaſures.	You may note them thus.
For 2 Pints carry a Quart.	Pints pt.
For 2 Quarts a Pottle	Quarts qt.
For 2 Pottles a Gallon	Pottles pot.
For 63 gallons a hogſhead	Gallons Gal.
For 4 hogſheads a run, or	Hogſheads hh. &c.
For 2 Hogſheads a But, &c	
For 2 Buts a Tun	

9 gall. a firkin Beer

Of Dry Meaſures.

Dry Meaſures are thoſe in which any kinde of Dry Subſtances are meaſured, as Corn, Salt, Coal, Sand, &c. of which a pint is the leaſt.

Dry Meaſures.	1 Pint	makes	1 Pint.	
	2 Pints		1 Quart.	
	2 Quarts		1 Pottle.	
	2 Pottles		1 Gallon.	
	2 Gallons		1 Peck.	
	4 Pecks		1 Buſhel	Land-Meaſure.
	5 Pecks		1 Buſhel	Water-Meaſure.
	8 Buſhels		1 Quarter.	
	4 Quarters		1 Chalder.	
	5 Quarters		1 Wey.	

Of Long Meaſures.

Long Meaſure is that by which is meaſured Cloth, Land, Board, Glaſs, &c.

Vid. 33 *Eliz.* & 25 *Eliz.*

3 Barly Corns	makes	1 Inch.	Long Meaſures.
12 Inches		1 Foot.	
3 Foot		1 Yard.	
3 Foot 9 Inches		1 Ell.	
6 Foot		1 Fadome.	
$5\frac{1}{2}$ yards or $16\frac{1}{2}$ foot		1 Pole or Perch.	
40 Pole or Perches		1 Furlong.	
8 Furlongs.		1 Engliſh Mile.	

A Table of Time.

Time conſiſteth of Years, Months, Weeks, Daies, Hours and Minutes, ſo that

1 Minute	makes	1 Minute.	Time.
60 Minutes		1 Hour.	
24 Hours		1 Day natural.	
7 Daies.		1 Week.	
4 Weeks		1 Month of 28 daies.	
13 Months, one day, and 6 hours		1 Year.	

Howbeit in ordinary Computation of Time, the whole year conſiſting of 365 daies, is divided into 12 Months, each Month (accounting one with another) containing $30\frac{5}{12}$ daies.

In

In Addition of Time.

See Reduction of Time in chap 6.

For 60 Minutes carry an Hour.
For 24 Hours a Day.
For 365 Daies a Year.

Of Apothecaries Weights.

The Weights uſed by Apothecaries, are. Grains, Scruples, Drams, and Ounces, of which

20 Grains	make	1 Scruple.	thus noted	℈
3 Scruples		1 Dram.		ʒ
8 Drams		1 Ounce.		℥
12 Ounces		1 Pound.		*lb*. or *li*.

Apothecaries Weights.	For 20 Grains carry a Scruple.
	For 3 Scruples carry a Dram.
	For 8 Drams carry an ℥.
	For 12 Ounces carry a *lb*.

Obſervation upon the difference of Weights and Meaſures.

The Meaſures and Weights of Wooll, Salt, Cheeſe, and Hony, are not the ſame in ſome Countries, as in others, therefore in ſuch caſes you muſt conform your operations to the Cuſtomes of thoſe places.

Of

Of other Weights and Meaſures neceſſary to bee known.

Billets.

B

Every Billet muſt bee 3 foot 4 inches in length.

The ſingle Billet	muſt be	7 ½	Inches about.
Caſt		10	
2 Caſt		14	

Billets of a Caſt muſt bee nicked within 4 inches of the end.

Billets of 2 Caſts within 6 inches of the middle.

Charcoal.

C.

A full Sack of Charcoal ſhould bee 4 Buſhels.

Cloath.

Of Canvas-Cloth, the C. is 120 Ells.

Of Fuſtian, 1 Cheff is 14 Ells.

Of Fine Linnen, Syndon, or Silks, the Cheff is 10 Ells.

Eeles.

E

Eeles ſee Fiſh.

Faggots.

F

The Faggot is to bee 3 foot in length, the band 24 inches about, beſides the knot.

Fiſh.

Fiſh.

Codfiſh, Haberdine, Ling, &c. are 124 to the hundred, 25 Eeles is a ſtrike, and ten ſtrike a Binde.

Furrs.

Of Fitches, Grayes, Jenets, Martins, Minks, Sables, 40 Skins make a Timber.

Of Badger, Cat, Coney, Kid, Lamb, 5 ſcore to the hundred.

G

Garlick.

A Rope is 15 Heads, and every hundred 15 Ropes.

Glaſs.

A Stone is 5 *lb*, 24 Stone (120 *lb.*) is one Seam.

Gloves.

A Dicker is 10 pair.

H

Herrings.

A Laſt of Herrings is 12 Barrels, every Barrel 12 *C.* and every *C.* 120.

Hides.

10 Hides are a Dicker.
20 Dickers a Laſt.

Horſeſhooes.

A Dicker is 10 Shooes.

Lath.

Lath.

L

Every Lath muſt be 5 foot in length.
2 inches in breadth.
½ inch in thickneſs.

Lead.

A Tun is 20 C. of all things, except Lead, which is 19 ½ C.

A Fodder of Lead is 19 C. and an half; A Load is 30 Formels, or 175 Stone; A Stone is 5 ½ *lb.*

Paper.

P

1 Quire is 25 Sheets.
2 Quire a Ream.
10 Reams a Bale.

Powder.

A laſt is 24 Firkins, every Firkin —— 100*lb.*
The empty Firkin ———————— 012.

Skins.

S

Of Parchment, 12 Skins make a dozen, 5 dozen a Rowle.

Of Calves skins, 12 are a dozen.

Of Goat skins, 50 a Kip.

Of Lamb and Sheep, 5 ſcore an hundred.

Steel.

A Faggot of Steel is ———— 120 *lb.*
A Burden of Gadſteel is 9 ſcore, or — 180.

Talſhide.

T

The Talſhide 4 foot in length, beſides the Carf.

Every Talſhide named.	1	muſt be	16	Inches about within a foot of the middle.
	2		23	
	3		28	
	4		33	
	5		38	

Plain Tile.

The length 10 inches and an half; The breadth 6 inches and a quarter; The thickneſs 3 quarters of an inch.

Gutter Tile.

Gutter Tile, or Corner Tile muſt bee in length 10 $\frac{1}{2}$ inches, with convenient thickneſs, breadth and depth, according, &c.

Roof Tile.

The length 13 inches; The thickneſs half an inch, and half a quarter, with convenient depth or breadth.

Timber.

A ſtack of wood 3 $\frac{1}{2}$ foot in height, 12 foot in length.

A Load is 50 foot of ſquare Timber; A foot is 12 inches in length, 12 in breadth, and 12 in thickneſs, ſo in a foot of ſquare Timber there is 1728 inches.

CHAP.

CHAP. 3.

SUBSTRACTION.

1 *Subſtraction teacheth to take a leſſer number from a greater, whereby you may know what remains.*

2 *Set down firſt the greater number, and then the leſſer underneath it, draw a line under them, and begin at the right hand, and take the figure underneath out of the figure above it, and ſet down the remainder underneath the line, according to the following Example,* Viz.

Subſtraction of Integers.

3 from 6 reſts 3, 6 from 7 reſts 1, 4 from 8 reſts 4, 5 from 9 reſts 4: So the Remains are———

Lent 9876
Paid 5463
————
4413

3 *When you cannot take the lowermoſt figure out of the uppermoſt, borrow an unite, or one, from the next uppermoſt figure, which is to bee accounted* 10 (*becauſe every place exceeds the other* 10) *and for every one ſo borrowed, carry one to bee added to the next lower figure.*

Admit I were to take 299 from 487, I firſt order theſe two numbers as in the Margent, draw a line, and ſay, 9 from 7 I cannot, but 9 from 17 reſts 8, which I ſet down under its proper place.

487
299
———
188

Then one I borrowed and 9 makes 10, and 10 from 18 reſts 8, the one I borrowed and 2 make 3, and 3 from 4 reſts one.

More readily thus, You ſee you cannot take 9 from 7, nor 10 from 8, and you know you muſt then borrow one as before, and account it 10, and repay that one by adding it to the next lower figure, therefore ſay

9 from 17—8   487
10 from 18—8   299
3 from 4—1   So the difference or Remainder is } 188

Again,

3 from 10—7   9210
8 from 11—3   3973
10 from 12—2   So the difference or Remains } 5237
4 from 9—5

Again,

8 from 10—2   90010
6 from 11—5   37658
7 from 10—3
8 from 10—2   So the Remains or difference } 52352
4 from 9—5

Other Examples for Practice.

	l.	l.	l.
Lent—	783400	932100	73920
Paid—	595630	785364	18959
Reſts—	187770	146736	54961

	l.	l.	l.
Lent —	900000	9301300	900032
Paid —	799981	8323479	811295
Reſts —	100019	977821	88737

Proof.

For proof add the Remains and the Sum paid together, and that will equal the mony lent.

Lent —	9870
Paid —	3987
Reſts —	5883
Proof —	9870

Subſtraction of Numbers of divers kinds.

4 *When the Numbers propounded are of divers names or kinds, and any figure of the upper number is leſs than the figure of the lower, which is to bee taken from it, you muſt borrow one from the next uppermoſt figure to increaſe it, and that one ſo borrowed, if from the place of pence (to bee brought to the place of farthings) is to bee accounted* 4, *if from the place of ſhillings* 12, *if from the place of pounds* 20, *and for every one ſo borrowed above, you add one to the next place below, and every one you borrow in the place of pounds (which is not brought from thence to the place of ſhillings) is* 10, as in the firſt kind of Subſtraction.

Example.

	l.	s.	d.	q.
Lent	907	14	5	2
Paid	328	15	6	3
Reſts	578	18	10	3
Proof	907	14	5	2

3 Farthings from the penny I borrow, reſts 1, which added to the 2 in the upper Summe make 3, to be placed under the rank of farthings; then add that penny borrowed above to the 6 pence below, and ſay, 7 from 12, reſts 5, and 5 is 10, which ſet under the rank of pence, then the ſhilling borrowed added to 15, ſay, 16 from 20, reſts 4, and 14 is 18, ſet that under the rank of ſhillings, then 9 from 17, reſts 8, and 3 from 10, reſts 7, and 4 from 9, 5, then add the Remains and the Summe paid together (for proof) and they make the whole Summe lent. But moſt conciſely thus,

3 from 4, reſts 1, and 2 is 3.
7 from 12, reſts 5, and 5 is 10.
16 from 20, reſts 4, and 14 is 18.
9 from 17, 8.
3 from 10, 7.
4 from 9, 5.

Again,

Say 2 from 4, reſts 2, & 1 is 3.
11 from 12, reſts 1, & 10 is 11.
17 from 20, reſts 3, & 13 is 16.
10 from 17, 7.
9 from 15, 6.
6 from 10, 4.
4 from 8, 4.

	l.	s.	d.	q.
Lent	8057	13	10	1
Paid	3589	16	10	2
Reſts	4467	16	11	3
Proof	8057	13	10	1

Again,

9 from 12, 3, and 7 is 10.
13 from 20, 7, and 10 is 17.
6 from 13, 7.
7 from 10, 3.
4 from 7, 3.

	l.	s.	d.	q.
Lent	7003	10	07	0
Paid	3665	12	09	0
Reſts	3337	17	10	0
Proof	7003	10	07	0

5 *If you lend ſeveral Sums at one or ſeveral times, and receive ſeveral ſummes accordingly, the ſeveral ſummes delivered are to bee added in one groſs ſum, and thoſe received into another, and the payments deducted out of the ſums delivered*: As in the following Examples.

	l.	s.	d.	q.
Lent at times.	703	10	11	1
	320	09	10	3
	310	02	09	0
	730	09	00	2
	650	08	09	0
	350	07	08	2
	3065	07	01	0

	l.	s.	d.	q.
Paid at times.	350	09	9	3
	205	07	06	0
	304	09	10	3
	507	17	09	0
	320	18	07	0
	550	13	08	3
	2189	17	03	1

Lent—3065—07—01—0
Paid—2189—17—03—1

Reſts—875—09—09—3

Proof—3065—07—01—0

	C.	qu.	lb.	℥.		C.	qu.	lb.
Bought	7640	1	15	10	Groſs	98	1	18
Sold	3872	2	17	12	Tare	39	2	24
Reſt	3767	2	25	14	Reſt	58	2	22
Proof	7640	1	15	10	Proof	98	1	18

In the First Example.

Subſtraction of Weight.
12 from 16, reſts 4, and 10 is 14.
18 from 28, reſts 10, and 15 is 25.
3 from 4, reſts 1, and 1 is 2.
3 from 10, 7.
8 from 14, 6.
9 from 16, 7.
4 from 7, 3.

In the Second Example.

24 from 28, reſts 4, and 18 is 22.
3 from 4, reſts 1, and 1 is 2.
10 from 18, 8.
4 from 9, 5.

Other Examples for Practice.

Year of our Lord 1657.

A Church built — 975.

Years expired — 682.

Proof — 1657.

Year of our Lord 1657.

A Man born. — 1519.

Years of his Age — 138.

Proof — 1657.

	l.	*s.*	*d.*	*qu.*		*l.*	*s.*	*d.*	*qu.*
Lent	9000	13	08	2	Lent	7008	13	09	2
Paid	3123	15	09	3	Paid	5019	17	10	3
Reſts	5876	17	10	3	Reſts	1988	15	10	3
Proof	9000	13	08	2	Proof	7008	13	09	2

	l.	s.	d.		l.	s.	d.
Lent	900	13	07	Lent	708	10	08
Paid	305	18	09	Paid	597	12	09
Reſts	594	14	10	Reſts	110	17	11
Proof	900	13	07	Proof	708	10	08

	C.	qu.	lb.	℥.		C.	qu.	lb.	℥.
Bought	970	2	13	7	Bought	780	1	17	8
Sold	398	3	17	8	Sold	391	2	18	9
Reſts	571	2	23	15	Reſts	388	2	26	15
Proof	970	2	13	7	Proof	780	1	17	8

	C.	qu.	lb.		C.	qu.	lb.
Groſs	780	3	20	Groſs	980	2	18
Tare	381	2	22	Tare	587	3	19
Neat	399	0	26	Neat	392	2	27
Proof	780	3	20	Proof	980	2	18

CHAP. 4.

Of MULTIPLICATION.

1 *Multiplication is that by which wee multiply two numbers, the one by the other to finde a third.*

2 *To Multiplication there belongs three principal Members, the Multiplicand, the Multiplier, and the Product.*

3 *The Multiplicand is the number given to to bee multiplied.*

4 *The Multiplier is the number by which the Multiplicand is multiplied, and (in reſpect of order, not neceſſity) is uſually the leaſt number, and the loweſt.*

5 *The Product is the third number produced by the Multiplication, and contains the Multiplicand, as many times as the Multiplier contains Unites.*

6 *Multiplication is either ſingle or compound.*

7 *Single Multiplication is when the Multiplicand and Multiplier conſiſt of one figure onely,* As in the firſt Table following, which explains the ſecond, *viz.*

Single Multiplication.

If 5 be given to be multiplied by 3, the Product is 15, for 3 times 5, or 5 times 3 is 15, here 5 is the Multiplicand, 3 the Multiplier, and 15 the Product, which contains 5 the Multiplicand, 3 times, and ſo is equal to the number of Unites contained in 3 the Multiplier.

The

The first Table.

1 Neither multiplies nor divides.
2 times 2 is 4, &c.

2 times 6 is 12, &c.

2	2	4	2	6	12
3	2	6	3	6	18
4	2	8	4	6	24
5	2	10	5	6	30
6	2	12	6	6	36
7	2	14	7	6	42
8	2	16	8	6	48
9	2	18	9	6	54
2	3	6	2	7	14
3	3	9	3	7	21
4	3	12	4	7	28
5	3	15	5	7	35
6	3	18	6	7	49
7	3	21	7	7	49
8	3	24	8	7	56
9	3	27	9	7	63
2	4	8	2	8	16
3	4	12	3	8	24
4	4	16	4	8	32
5	4	20	5	8	40
6	4	24	6	8	48
7	4	28	7	8	56
8	4	32	8	8	64
9	4	36	9	8	72
2	5	10	2	9	18
3	5	15	3	9	27
4	5	20	4	9	36
5	5	25	5	9	45
6	5	30	6	9	54
7	5	35	7	9	63
8	5	40	8	9	72
9	5	45	9	9	81

The second Table, which is explained by the first.

1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	34	32	40	48	56	64	72
9	18	27	36	45	34	63	72	81

8 *Compound Multiplication is when the Multiplier and Multiplicand, either one or both, conſiſt of more figures than one.*

Compound Multiplication.

9 *Multiplication ſerveth inſtead of many Additions;* for if I would know what 6 times 8 is, Addition bids mee ſet down 8, 6 times, or 6, 8 times, and adde them together, to diſcover 6 times 8 to bee 48, which Multiplication reſolveth at once, as by either of the former Tables is ſufficiently evident.

10 *When the Numbers end with ſignificant figures, place them as in Addition and Subſtraction.* So, if 3 men have each 323 Sheep, or other Cattel, you finde they have in all 969.

Place the numbers as in the Example in the Margent, and ſay,

323
3
969

3 times 3 is 9 }
3 times 2 is 6 } Which you are to write under the ranks of your multiplying figures, in order as you multiply.
3 times 3 is 9 }

11 *When the Multiplier conſiſts of more figures than one, ſo many figures as it hath, ſo many ſeveral Products muſt bee ſubſcribed under the line, which at laſt being added into one Summe, gives you the total Product of all.*

The Multiplier of more figures than one.

So 1232 being given to bee multiplied by 32, the operation will ſtand thus, for the product of 1232 multiplied by 2, is 2464. Again, 1232 multiplied by 3, the product is 3696, which ſeveral products ſtanding in their due order (that is, the laſt figure of each product under his reſpective multiplying figure) and added together, produce 39424, the product required.

1232
32
2464
3696
39424

In like manner 1231 being given to bee multiplied by 321, the product is 395151, and the operation will alſo ſtand as in the Margent. Obſerve, that when your Multiplicand and Multiplier are ſet down, you are to draw a line under them before you proceed to the Multiplication, and when your Multiplication is ended, you are to draw a line under the products, before you add them together.

1231
321
1231
2462
3693
395151

The Product amounting to 10.

12 *When the Product of any particular figure amounts to* 10, *place that which is over and above* 10 *under the line as before, and for every* 10 *keep one in minde to bee added to the next rank.*

Example, 4563 being given to bee multiplied by 45, the work will ſtand as in the Margent; for 5 times 3 being 15, I write down 5, which is over and above 10, and for the 10 bear one in minde to the next rank, then 5 times 6 is 30, and 1

4563
45
22815
18252
205335

in minde is 31, I ſet down 1, and for the 3 tens, carry 3 to the next rank, after which manner the reſt of the work is performed, as you may ſee in the Example.

Numbers ending with Ciphers.

13 *When the numbers given to bee multiplied do one or both of them end with Ciphers, place their firſt ſignificant figures to the right hand, one under another, and when the Multiplication of the ſignificant figures is finiſhed, annex all the Ciphers after the number produced by the Multiplication, which will give you the Product demanded.* As appears by the following Examples.

```
  456789             57800
      5700          15000
----------        ---------
 3197523          2890
2283945          578
----------        ---------
2603697300       867000000
```

Ciphers between ſignificant figures.

14 *When in the Multiplier Ciphers are included between ſignificant figures, multiply by the ſaid ſignificant figures, omitting ſuch Cipher or Ciphers, and obſerve to ſet each particular Product in its due place.* As in the Examples following.

```
  2345              34567
   403               3005
------          ---------
  7035             172835
9380            103701
------          ---------
945035          103873835
```

Or otherwiſe as in the following Examples.

3456789	567893
20003	3005
10370367	2839465
69135780000	170367900
69146150367	1706518465

To multiply by 10, 100, 1000, &c.

15 *When a number is given to bee multiplied by a number conſiſting of an Unite, in the firſt place toward the left hand, and nothing but Ciphers towards the right, ſuch as are* 10, 100, 1000, 10000, *&c. the Multiplication is performed by ſetting the Ciphers of the Multiplier after the figures of the Multiplicand.* So, if 34567 were to bee multiplied by 10, add one Cipher, and the work is performed, if by an 100 add 2, if by a thouſand add three Ciphers, 345670, 3456700, 34567000.

Continual Multiplication.

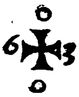
16 *When* 3 *or more numbers are given to bee multiplied together, they are ſaid to bee multiplied continually, and this kinde of multiplying is termed continual Multiplication.* So, if 8, 28, and 56 were given to bee multiplied continually, firſt 28 multiplied by 8, produceth 224, and 224 multiplied by 56, produceth 12544, the laſt Product required.

28
8
224
56
1344
1120
12544

17 *Multiplication may bee proved by Diviſion, and Diviſion by Multiplication, as in chap. the 5th. Rule the 30th. But being Diviſion may bee more ſpeedily, and as effectually proved by Addition, as in chap. the 5th. Rule the 31; and that the proof now practiſed in Multiplication, is both more ſpeedy and eaſie for a Learner, I here inſert it.*

See the 30 and 31 Rules in the 5th, Chapter.

```
  345678
     579
--------
 3111102
2419746
1728390
--------
200147562
```



18 Caſt away the nines in the Multiplier, and ſet 3 the remainder on the right ſide of the croſs, then do the like in the Multiplicand, and ſet the remainder 6 on the left ſide of the croſs, multiply theſe 2 together, and caſt away the nines, and ſet (0) at the head of the croſs, then caſt away the nines in the Product, and ſet (0) at the foot of the croſs, and when the figures or ciphers at head and foot agree, the work is truly performed, elſe not.

Proof of Multiplication.

Other Examples for Practice.

```
    789789           763453
       354              273
 ---------        ---------
   3159156          2290359
  3948945          5344171
 2369367          1526906
 ---------        ---------
 279585306        208422669

     0                3
   3 ✠ 3            1 ✠ 3
     0                3
```

Before the Learner proceed to the next Chapter, it is materially neceſſary that hee be perfect in the following Tables.

Twice 12 *is* 24, *&c.*

2	12	24
3	12	36
4	12	48
5	12	60
6	12	72
7	12	84
8	12	96
9	12	108
10	12	120

Twice 16 *is* 32.

2	16	32
3	16	48
4	16	64
5	16	80
6	16	96
7	16	112
8	16	128
9	16	144
10	16	160

Twice 14 *is* 28.

2	14	28
3	14	42
4	14	56
5	14	70
6	14	84
7	14	98
8	14	112
9	14	126
10	14	140

Twice 28 *is* 56.

2	28	56
3	28	84
4	28	112
5	28	140
6	28	168
7	28	196
8	28	224
9	28	252
10	28	280

Other Examples for Practice, might bee here inſerted, but the conveniences of thoſe which moſt conduce to the benefit of the Learner, will more ſignificantly appear in the next Chapter, where ſeveral Queſtions are contrived for his Advantage, but more eſpecially in the 6th. Chapter, where the abſolutely neceſſary Rules in the 5 firſt Chapters of this Treatiſe are largely diſcuſſed.

See the 15, 17, and 18 Rules of the 5th. chapter. Alſo the latter part of the obſervation upon the 10th. Example in that chapter.

CHAP. 5.

Of DIVISION.

1

BY *Diviſion wee diſcover how often one number is contained in another.*

2 *Diviſion hath* 3 *Terms, Members or Parts.*

1 *The Dividend,* 2 *The Diviſor,* 3 *The Quotient.*

Some ſay 4, and repute the Remainder as

one of the Terms, which a Critick may quarrel at, though (in order to the Learners Advantage) it is not amiſs to accept it ſo.

3 *The Dividend is the number given to bee divided.*

4 *The Diviſor is the number by which the Dividend is divided.*

5 *The Quotient (which diſcovers how often the Diviſor is contained in the Dividend) is the number produced by the Diviſion.* So, if 40 were the number to bee divided by 8, the number produced would bee 5, for 8 is to bee found 5 times in 40, and here 40 is the Dividend, 8 the Diviſor, and 5 the Quotient.

6 *The Remainder which* (if the work bee well performed, is alwaies leſs than the Diviſor) *is Numerator of a Fraction, to which the Diviſor is Denominator*, as in the ſecond Example.

7 *Two particular Species of Diviſion are, Bipartition, and Tripartition.*

8 *Bipartition, otherwiſe called Mediation, is Diviſion by 2.*

9 *Tripartition is Diviſion by 3.*

10 *Bipartition, Tripartition, Quadripartition, &c. are here firſt taught, becauſe they are eaſie, and lead the Learner by the hand to a familiarity with the following kinds.*

11 *In Bipartition, Tripartition, &c. the beſt way is to ſubſcribe the Quotient under the Dividend;* As in the following Example.

Now to know how many times 2 is contained in 2468 I ſay

Diviſor 2 | 2468 Dividend
1234 Quotient

1 Example. Diviſion by 2

The half of 2	is	1	Or thus, Once 2	in	2
The half of 4	is	2	Twice 2	in	4
The half of 6	is	3	Thrice 2	in	6
The half of 8	is	4	4 times 2	in	8

12 *But if the Dividend conſiſt of Figures that cannot bee divided without leaving a Remainder,* as 1, 3, 5, 7, 9. then in ſuch caſe obſerve the following Order.

6 times 2 in 13, reſts 1,
7 times 2 in 15, reſts 1,
8 times 2 in 17, reſts 1,
9 times 2 in 19, reſts 1,

which being to be added to the figure of 5 following makes, 15, &c.

2 Example. Diviſion by 2.

which is to be placed at the end of the Quotient, as Numerator of a Fraction, to which 2 the Diviſor is Denominator.

2 | 13579
6789 $\frac{1}{2}$ Numerator. Denominator.

1 Numerator.
2 Denominator.
See Numeration of Fractions chap. 7. Rule 1.

Or thus,

The half of 13	is	6.
The half of 15	is	7.
The half of 17	is	8.
The half of 19	is	9,

and there reſts $\frac{1}{2}$, which ſhews that 13579 Teſters turned into Shillings, would give 6789s. and $\frac{1}{2}$ ſhilling

3 Example. Diviſion by 2.

that is an odd Teſter, or *6d.* or admit the Dividend to bee Angels, and the *Quotient* is Pounds, the Remainder 10*s.*

Other Examples for Practice.

Diviſion by 3.
6 times 3 in 19, reſts 1
5 times 3 in 17, reſts 2
7 times 3 in 23, reſts 2
7 times 3 in 21, reſts 0
[illegible] times 3 in 01, reſts 1
5 times 3 in 15, reſts 0

$$3 \,|\, \underline{1973115}$$
$$657705$$

Now becauſe I cannot take 3 from 1, I ſet a Cipher in the *Quotient*, and admit the Dividend to be Groats, the *Quotient* is ſhillings, or admit the Dividend to bee Nobles, the *Quotient* is pounds ſterling.

Diviſion by 4.
4 times 4 in 19, reſts 3
9 times 4 in 37, reſts 1
3 times 4 in 13, reſts 1
2 times 4 in 11, reſts 3
7 times 4 in 31, reſts 3
8 times 4 in 35, reſts 3

$$4 \,|\, \underline{1973115}$$
$$493278\tfrac{3}{4}$$

Admit the Dividend to be Threepences, and the *Quotient* is Shillings, every Unite remaining *3d. id eſt*, *9d.* which is ¾ of a Shilling, or admit the Dividend to be Crowns, and the *Quotient* is pounds ſterling, the Remains 15*s.*

3 times 5 in 19, reſts 4
8 times 5 in 41, reſts 1
2 times 5 in 13, reſts 3
7 times 5 in 35, reſts 0
0 times 5 in 0, reſts 0

5 | 191350
38270

Diviſion by 5.

Admit the Dividend to be Dollers, or Ducats, &c. at 4*s.* *per* piece, and the *Quotient* is pounds ſterl.

Once 6 in 7, reſts 1
Twice 6 in 13, reſts 1
Twice 6 in 14, reſts 2
4 times 6 in 25, reſts 1
Twice 6 in 16, reſts 4
7 times 6 in 47, reſts 5

6 | 734567
$122427\frac{5}{6}$

Diviſion by 6.

Admit the Dividend to bee that number of peeces at 3*s.* 4*d.* or ten Groats *per* piece, the *Quotient* will bee pounds, and the remains 16*s.* 8*d.*

Once 7 in 7, reſts 0
0 times 7 in 0, reſts 0
0 times 7 in 1, reſts 1
2 times 7 in 14, reſts 0
0 times 7 in 0, reſts 0
0 times 7 in 0, reſts 0
0 times 7 in 0 reſts 0

7 | 7014000
1002000

Diviſion by 7.

Admit the Dividend to bee pounds of weight, at 7*lb.* to the Stone, and the *Quotient* will be Stones of Weight.

Diviſion by 8.

8 times 8 in 70, reſts 6
7 times 8 in 63, reſts 7
8 times 8 in 70, reſts 6
8 times 8 in 69, reſts 5
6 times 8 in 50, reſts 2

8 | 703090
87886 $\frac{2}{8} \big| \frac{1}{4}$

Admit the Dividend pounds of weight at 8*lb.* to the Stone, and the Quotient will bee Stones of weight, or admit the ſame ſo many half Crowns, and the Quotient will bee pounds ſterl.

Diviſion by 9.

Once 9 in 9, reſts 0
0 times 9 in 0, reſts 0
0 times 9 in 0, reſts 0
0 times 9 in 2, reſts 2
3 times 9 in 27, reſts 0
0 times 9 in 0, reſts 0
0 times 9 in 0, reſts 0

9 | 9002700
1000300

To divide by 10. See 28 Rule in this chap.

13 To divide by 10 is no more than to cut off the laſt Cipher or Figure in your Dividend, and take the Remains for the Quotient, ſo 123040 times 2*s.* divided by 10 gives 12304*l.*

10 | 12304 | 0

To divide by 20 See 28 Rule in this chap.

14 To divide by 20, is to cut off the laſt cipher or figure as before, and half the Remainder; So 123040*s.* divided by 20, would give 6152*l.*

20 | 12304 | 0
6152

3 times 12 in 37, reſts 1
Once 12 in 13, reſts 1
Once 12 in 14, reſts 2
Twice 12 in 24 reſts 0
0 times 12 in 0, reſts 0

Diviſion by 12.

12 | 373440
31120

So admit the Dividend to bee pence, and the Quotient is ſhillings, which divided by 20, give 1556*l.*

12 | 78321034
| 6526752 $\frac{10}{12}$ | $\frac{5}{6}$

12 | 54321070
| 4526755 $\frac{10}{12}$ | $\frac{5}{6}$

12 | 3000403
| 250033 $\frac{7}{12}$

12 | 2400084
| 200007

15 *To multiply and divide a number conſiſting of ſeveral Denominations by any of the Digits, as* 2, 3, 4, 5, 6, 7, 8, 9. *though heretofore neglected, is of ſuch neceſſary importance to the Practitioner, that it ought not to bee omitted,* *viz.* multiply 34*l.* 3*s.* 8*d.* by 8 thus.

A ſum of ſeveral denominations, multiplied and divided by a Digit number.

See the 5th. and 6th. Rules of the 14th. chapter.

	l.	s.	d.
	34	3	8
			8
8	273	9	4
	34	3	8

8 times 8 is 64 pence, ſet down the 4 pence, and bear 5 ſhillings in minde, to bee carried to the rank of ſhillings, then 8 times 3*s.* is 24*s.* and 5 in minde is 29, ſet down the nine ſhillings, and carry a pound (or 20*s.*) to the rank of pounds, then 8 times 4*l.* is 32, and 1 in minde, is 33, and 8 times 3 is 24, and 3 in minde, is 27, whence it is evident, that if an hundred weight of any commodity coſt 34*l.* 3*s.* 8*d.* that 8 hundred weight of that commodity will coſt 273*l.* 9*s.* 4*d.* Now, divide that number again by 8, and thence it is evident, that if 8 hundred coſt 273*l.* 9*s.* 4*d.* one hundred will coſt 34*l.* 3*s.* 8. *viz.*

3 times 8 in 27, reſts 3.
4 times 8 in 33, reſts 1 pound, which carried to the 9*s.* in the rank of *s.* make 29*s.* then 3 times 8 in 29, reſts 5*s.* which turned into pence, and added to the 4*d.* in the rank of pence, make 64, and 8 times 8 in 64. reſts 0.

A ſum of ſeveral denominations, multiplied and divided by an Article, or Decimal number.

16 *A ſumme conſiſting of ſeveral Denominations, may likewiſe bee multiplied and divided by a decimal or compound number, viz.* multiply 3*l.* 15*s.* 8*d.* by 10 thus

10 times

l. *s.* *d.*
3—15— 8
10
———
|37—16—08
———

10 times 8 is 80, ſet down 8, and carry 6*s.* to the rank of ſhillings, then 10 times 5*s.* is 50*s.* and 6 in minde, is 56, ſet down the 6*s.* and carry 5 Angels in minde, then 10 Angels, and 5 in minde is 15 Angels, which make 7*l.* 10*s.* ſet down 10*s.* and carry 7*l.* So 10 times 3 is 30. and 7 in minde is 37, whence 'tis evident, that if

l. *s.* *d.*
a yard of cloth coſt ——— 3—15—8
that 10 yards will coſt ——— 37—16—8

Now divide that again by 10, and thence 'tis evident that a yard will

l. *s.* *d.*
coſt ——— 3—15—8

Viz.

l. *s.* *d.*
10|37—16—8
———
3—15—8

3 times 10 in 37, reſts 7*l.* which turned into ſhillings, and added to 16*s.* in the rank of ſhillings, make 156*s.* then 15 times 10 in 156, reſts 6*s.* which turned into pence (with 8 in the rank of pence) make 80*d*, and 8 times 10 in 80, produceth 3*l.* 15*s.* 8*d.* to prove the firſt work. It is hence apparent, that Multiplication and Diviſion do interchangeably prove one another.

For other proof, See the 30 Rule in this chapter.

I could here acquaint the Learner with many pretty and pleaſing conveniences that accompany ſuch kind of operations, but theſe are onely to ripen him for the underſtanding of thoſe which hee will meet withall more at large in the Rules of Practice, and there-

See Rule 6, &c. in chap. 14.

fore I conclude this kinde of Multiplication and Diviſion with the following Example.

A ſum of ſeveral denominations, multiplied and divided by a compound number.

l. s. d.
75—16—06
12 multiply by 12

Divide by 12 | 909—18—00

75—16—06 For proof.

See the 5, 6, 7, Rules in the 14th. chapter, and Reduction of Flemmiſh to Engliſh mony, &c. in the firſt part of the 21th. chapter.

17 *To multiply and divide any Compound Number* under 20, conſiſting of one Denomination, as 12, 13, 14, 15, 16, 17, 18, 19. *may bee many times of much eaſe to the Learner (for proof of his work)* and therefore I inſert the following method, as knowing it to bee moſt ſpeedy and eaſie for that purpoſe.

The ordinary way of multiplying by any of the aforeſaid number is before ſufficiently explained.

In this kinde of Multiplication you may omit ſetting down the Multiplier, as in the following Examples.

18 *To multiply any number by* 12, *viz.* multiply by 2, that is, double your Multiplicand, and ſet the Product a place toward the right hand, then draw a line, and add the 2 uppermoſt numbers together, and the ſumme

7834
(2) 15668
Product—94008
Proof — 7834

will bee 94008. To prove which, take onely the half of the ſecond number, and that is equal to the firſt.

Multiplication and Diviſion by 12, 13, 14, 15, 16, 17, 18, 19, 20.

7834 multiplied and divided by 13 }
For proof, divide the ſecond Number by 3 }

7834
(3) 23502
Product — 101842
Proof 7834

7834 multiplied and divided by 14 }
For proof, divide the ſecond number by 4, &c. }

7834
(4) 31336
Product 109676
Proof 7834

7834 multiplied and divided by 15 }

7834
(5) 39170
Product 117510
Proof 7834

7834 multiplied and divided by 16 }

7834
(6) 47004
Product 125344
Proof 7834

7834

7834
(7) 54838

7834 multiplied and divided by 17 { Product 133178
Proof 7834

7834
(8) 62672

7834 multiplied and divided by 18 { Product 141012
Proof 7834

7834
(9) 70506

7834 multiplied and divided by 19 { Product 148846
Proof 7834

Multiplication and Diviſion by 20.

19 *To multiply and divide by 20, thus*

To multiply, double the number, and add a cipher.

To divide, cut off the cipher, and *half* the Remainder, as in the 14th Rule of this chapter.

7834
15668|0
7834

20 *To divide a number by a Diviſor conſiſting of 2 figures exceeding 20, or of more places*

than in the former varieties, make a crooked line at each end of the Dividend, one on the left hand for the Diviſor, and another on the right hand for the Quotient, then diſtinguiſh by a point or prick, ſo many of the formoſt places of the Dividend, as will contain the Diviſor, which number ſo ſet apart, may for diſtinction ſake be called the Dividual. So 567890 being given to bee divided by 68, ſet a prick under 7, becauſe fewer places will not contain the Diviſor, than is the Dividual 567.

6
12
4) 334
83

21 *The Numbers thus prepared, ask how often the Diviſor is contained in the Dividual, and place that which anſwers to the Queſtion in the Quotient, draw a line underneath, and ſubſtract the Product from the Dividual, ſetting down the Remainder.*

68) 567890(835
544
238
204
349
340

17) 567890
57
51
68
109

If the Diviſor and the Dividual conſiſt of equal places, ask how often the firſt figure of the Diviſor toward the left hand is contained in the firſt figure of the Dividual towards the left; but if the Dividual conſiſt of one place more (as here it doth) ask how often the firſt figure of the Diviſor is contained in the two formoſt places of the Dividual, *viz.* how often 6 is contained in 56, but obſerve, that 6 is to bee taken but ſuch a number of times out of 56, as 8 may bee taken

The Diviſor and Dividual of equal places.

Dividual of more places than the Diviſor.

the like number of times out of the Remainder of the Dividual, therefore though I can take 9 times 6 out of 56, yet becauſe I cannot take 9 times 8 out of * 27 the Remainder, I make trial of 8, which is the greateſt number of times that 6 can bee taken out of 56 (* never make trial of above 9 times) becauſe you cannot take more times 8 out of the Remainder, and this ſhews you, that 68 can be taken but 8 times out of 567, then ſet 8 in the Quotient, and multiply that into the Diviſor, and ſet the Product under 567, the Dividual, and draw a line under the Product, and ſubſtract the ſame from the *Dividual*, ſo is the Remainder 23.

```
68)567890(8
   544
   ---
    23
```

* Every Unite remaining when another figure ſucceeds, to which it may bee joyned, is accounted 10. So, if 9 times 6 bee taken out of 56 there will remain 2, which is accounted 20, becauſe 7 the third figure of the Dividual ſucceeds, to which it is to be added and reputed 27. See the ſecond Example of this Chapter.

* Though the firſt part of the Diviſor may bee found more than 9 times in the correſpondent part of the Dividual, yet the whole Diviſor cannot bee found more than 9 times in the whole Dividual.

22 *Set a point under* 8 *the next place of the Dividend, and add that to the Remainder, which gives* 238 *for a new Dividual*, and the work will ſtand as in the Margent.

```
68) 567890 (8
    544
    ---
    238
```

23 *Renew the Queſtion, and proceed according to the* 21*th. Rule, viz.* ſeek how often 68 may bee found in 238, which will

bee 3 times, for there is 3 times 6 out of 23, and 3 times 8 may bee taken out of the Remainder, then place 3 in the Quotient, and multiply it into the Diviſor, place the Product under the laſt Dividual, draw a line, and ſubſtract the Product from the ſaid Dividual, the Remainder is 34, and the work ſtands as in the Margent.

```
68) 567890 (83
     544
    -----
     238
     204
    -----
      34
```

Proceed according to the 22th. Rule in pricking and tranſcribing the next figure of the Dividend, and the new Dividual will bee 349, as by the Example in the Margent.

```
68) 567890 (83
     544
    -----
     238
     204
    -----
      349
```

24 *Repeat the Queſtion, and proceed according to the 21th. Rule*, and you will finde 5 times 6 in 34, for ſo many times 8 may bee found in the Remainder, then 5 multiplied into the Diviſor, and the Product ſubſtracted from the laſt Dividual, the Remainder will bee 9.

```
68) 567890 (835
     544
    -----
     238
     204
    -----
      349
      340
    -----
       90
```

25 Prick and bring down the 0, *and the new dividual will bee* 90, in which there is but once 68, and the remains 22, and the whole work ſtands as in the Margent.

```
68)567890 (8351 * 22/68 | 11/34
   544
   ---
    238
    204
    ---
     349
     340
     ---
       90
       68
       --
       22 remains.
```

* The Remains are numerator of a fraction, & the Diviſor Denominator, as by the 6th. Rule, and 2d. and 4th. Examples of this chapter, &c.

26 So often as the Queſtion is repeated in Diviſion, ſo many figures or ciphers muſt there bee in the Quotient, which may bee diſcovered by the number of points under the places of the Dividend; and ſo many ſeveral operations are there in the whole work, which you are to continue till the laſt place of the Dividend bee tranſcribed, as is evident by the former and following Examples.

But if your Quotient conſiſt of an unite, then (becauſe one neither multiplies nor divides) ſet the Diviſor under the Dividual, and ſubſtract it from thence.

Before I proceed to any other Examples, that I may ſmooth the way, I think it requiſite to draw the heads of what hath been delivered into as ſhort and ſignificant a method as poſſibly I can. *Viz.*

1 *Prick the Dividend.*

2 *Take your Quotient.*

3 *Multiply your Quotient into your Diviſor, and ſet the Product under the Dividual.*

4 *Draw a line and ſubſtract that Product from the Dividual.*

5 Prick and bring down the next figure or cipher to bee added to the Remains, and if thoſe Remains, when the figure or cipher is ſo tranſcribed, will not afford you a new Dividual (as being leſs than your Diviſor) ſet a cipher in the Quotient, and prick and bring down one or more of the next figures or ciphers to bee added to thoſe Remains, till you make a new Dividual, which muſt conſiſt of a number as great or greater than your Diviſor, and for every figure or cipher you ſo bring down to bee added to the Remains, firſt ſet a cipher in the Quotient.

```
68)7550312(111034
   68
   --
    75
    68
    --
     70
     68
     --
      231
      204
      ---
       272
       272
       ---
```

27 When the Diviſor and Dividual conſiſt of equal places, proceed as in this Example, *viz.* here I finde 6 will bee found once in 7, and 8 once in 15: Now ſeeing that * one neither multiplies nor divides, I ſet 68 under 75, and ſubſtract it, and there reſts 7, then I prick and bring down 5 to bee added to the remains, which you may ſee is performed 3 ſeveral times by reaſon of an Unite in the Quotient 3 times together, after which you finde the remains to bee 2, then I prick and

[illegible] 21th. [illegible] this [illegible]pter.

* See the 26th. Rule of this Chapter.

bring

bring down 3 to make a new Dividual, but I cannot take 68 from 23, therefore I ſet a cipher in the Quotient, and prick and bring down 1, and in 231 I finde 68,3 times, which is 204, and ſubſtracted from 231 leaves 272, in which there is 68 four times, for there is 4 times 6 in 27, and 4 times 8 in 32, the Remainder, which makes 272, ſo is the work finiſhed; *and as there is 6 points or pricks in the Dividend, ſo is there 6 places in the quotient.*

So many pricks as are in the Dividend, ſo many figures or ciphers in the Quotient.

```
68) 37354 (549 22/68
     340
     ---
      335
      272
      ---
       634
       612
       ---
        22
```

If 37354*l.* were to bee divided amongſt 68 men, you finde by the following Example every one of thoſe 68 men would have 549*l.* and $\frac{22}{68}$ of a *l.* for by the 6th. and 25th. Rules, and ſecond and 4th. Examples of this chapter, you finde the Remains are alwaies Numerator of a fraction, to which the Diviſor is Denominator: Now in ſuch caſe to know the value of the fraction, multiply 22 the Numerator by 20, becauſe ſo many ſhillings make a pound, and divide it by 68 the Denominator, and you will finde 6*s.* and $\frac{32}{68}$*s.* remaining, then multiply 32 by 12, becauſe ſo many pence

See the 6 Rule, & 2 & 4 Example of this chap. The value of a Fraction.

See the 1 Rule of chap. 8.

pence make a ſhilling, and you will finde 5*d.* and $\frac{44}{68}$*d.* multiply 44 by 4, becauſe ſo many *q.* make a penny, and you will finde 2$\frac{40}{68}$*d.* but here you might have * abbreviated the fraction to $\frac{11}{14}$, and the work would have been ſooner ended, as in the a Rule of the 8 Chapter,

```
        22
         20
       ----
68) 440(6s.
    408
    ----
     32
     12
    -----
68) 384 (5d.
    340
    ----
     44
      4
    ----
68) 176(2 40/68 q.
    136
    ----
     40
```

* See Example 1 in this chap.

28 *When the Diviſor conſiſts of an Unite in the firſt place towards the left hand, and nothing but ciphers toward the right, the Diviſion is performed by cutting off ſo many places of the Dividend towards the right hand, as the Diviſor hath ciphers, which figures ſo cut off, are numerator of a fraction, which hath for denominator the diviſor given.* So if 5678200 were to bee divided by 1000, the number required by the Diviſion is 5678 $\frac{200}{1000}$.

The Diviſor an Unite in the firſt place, and nothing but Ciphers towards the laſt.

See the 13 & 14 Rules in this chap.

29 *When the Diviſor conſiſts of one or more ſignificant figures in the firſt place (or more of the formoſt places) towards the left hand, and nothing but ciphers toward the right, cut off ſo*

The Diviſor of one or more figures in the firſt place, and nothing but ciphers in the laſt *many places of the Dividend towards the right hand, as the Diviſor hath ciphers towards the ſame, and divide the remaining part of the Dividend on the left hand, by the remaining part of the Diviſor, (when the ciphers are omitted) remembring after the Diviſions ended, to reſtore as well the cipher to the Diviſor, as the places cut off to the Dividend.* So, if 3456789 were given to be divided by 203000, the Quotient will be found 17 $\frac{5789}{203000}$.

Example.

```
203000) 3456|789 (17 5789/203000
        203
        ----
        1426
        1421
        ----
           5
```

Cut off the three laſt places of the Dividend towards the right hand, (becauſe the 3 laſt places of the Diviſor are ciphers) and divide the remaining part of the dividend, *viz.* 3456, by 203, the Quotient will be found 17, and reſtore 5 the remainder to 789, the figures cut off there will be 5789, for the Numerator of a Fraction, whoſe denominator is the whole diviſor, *viz.* 203000.

6/9

30 *When the Dividend is leſs than the Diviſor, place the dividend as numerator of a fraction, and the diviſor as denominator, and ſuch fraction is the quotient ſought.* So if 6*l.* ſterling were to be divided amongſt 9 men, each mans

proportion would be $\frac{6}{9}$ or $\frac{2}{3}$*l.* which is 13*s.* 4*d.* as is apparent by the 27 Rule of this Chapter, &c.

See the 27th. Rule of this Chapter, and the 1 Rule of the 8 chapter.

31 *Diviſion and Multiplication do interchangeably prove one another, as by the 16th. Rule in this Chapter, for in Diviſion, if you multiply the quotient by the Diviſor, and to the Product adde the Remains, the Product will bee equal to the Dividend.* So

See the 16th. Rule of this Chapter.

Proof of Diviſion by Multiplication.

Firſt, In the 25th. Rule of this Chapter, 8351 the quotient being multiplied by 68 the diviſor, and 22 the Remains added to the Product, will be equal to 567890 the Dividend.

Secondly, In the 27th. Rule of this Chapter, 111034 the quotient, multiplied by 68 the Diviſor, the Product is equal to 7550312 the Dividend.

Again, in Multiplication the Product being divided by the Multiplier, the Quotient will give you your Multiplicand, *viz.* In the 17th. Rule in the 4th. Chapter the Product 200147562, divided by 579 the Multiplier, the Quotient gives 345678 the Multiplicand.

Proof of Multiplication by Diviſion.

The Proof.

579) 200147562 (345678

1737

2644

2316

3287

2895

3925

3474

4516

4053

4632

4632

This laſt proof I thought fit to inſert, to exerciſe the Learner, for whoſe incouragement I have afterwards ſet down 10 Examples, which with a little practice will make him perfect in Diviſion, &c.

First.

35678 Multiplicand.
6 Multiplier.

Diviſor 6|214068 Product.

35678 *Quotient* equal to the Multiplicand.

Second.

35678
8

8|285424

35678

Third.

356789
9

9|3211101

356789

Fourth.

35678 by 12.
12) 71356

12) 428136 Product.

35678 Proof.

12|428136|35678
36
68
81
72
93

Fifth.

35678 by 18.
8) 285424
642204 Product.
35678 Proof.

1222
642204(167034
0 42 33393 3 | 35678
02
20
24

Sixth.

35678 by 19.
9) 321102
677882 Product.
35678 Proof.

Seventh.

789678 Multiplicand.
28 Multiplier.

6317424
1579356
28) 22110984 (789678.
196
251
224
270
252
189
168
218
196
224
224

Eighth.

56789
354

227156
283945
170367

354) 20103306 (56789

1770—firſt Product.

2403
2124 ſecond

2793
2478 third

3150
2832 fourth

3186
3186 fifth } All which make the Dividend for proof.

20103306

This kinde of Diviſion may likewiſe bee proved by Addition; for if the ſeveral Products ariſing from the Multiplication of the diviſor by each particular quotient, and the remainder of the laſt ſubſtraction (when there is any) bee added together, in the ſame order of ranks, as they are placed in the diviſion, the ſumme will bee equal to the dividend, as in the 10th. Example.

In the 9th. Example you finde 7 three ſeveral times in the Quotient, and that 5439 is the Product of 7 multiplied into the Diviſor; 7, being the firſt figure of the Quotient toward the left hand, therefore when you come to 7 again in the third place, and in the 6th. you may ſpare the pains of multiplying 7 into the Diviſor, and only tranſcribe the Product 5439 in thoſe 2 places.

Ninth.

```
           7878978
               777
     -------------
          55152846
         55152846
        55152846
     -------------
777) 6121965906) 787897.
     . . . . . . .

     5439
     ----
      6829
      6216
      ----
       6136
       5439
       ----
        6975
        6216
        ----
         7599
         6993
         ----
          6060
          5439
          ----
           6216
           6216
```

Tenth.

In the tenth Example you finde 9, 4 times in the Quotient, and that the Product of 9, multiplied into the Diviſor, is 4995. So you need only tranſcribe the Product in the 3 laſt places, as in the Example.

Obſervation upon the 10th Example.

Tenth.

49999
555

49995
49995
49995

555) 5549445 (9999
1 Product —4995

5544
2 Product——4995

5494
3 Product——4995

4995
4 Product —— 4995

5549445

Your Multipliers in each Example conſiſting of 3 equal figures, when you have multiplied the firſt, you need not do otherwiſe than to ſubſcribe the ſame Product twice, each time a degree to the left hand, &c.

Some of the other Conveniencies that accompany this kinde of Diviſion, are ſet forth in my former book, fol. 62. where ſeveral able Mathematicians are particularized, who have (in print) publickly approved it.

I could ſay much more to commend *this*

Method of Diviſion, but if no more could bee ſaid, than that it chargeth not the memory, 'twere commendation ſufficient: I leave others to their pleaſure, but, until my reaſon bee convinced, ſhall not make uſe of any other way.

There is onely one Compendium remaining, which I think fit to inſert for the Learners incouragement, becauſe, when hee comes to bee converſant with buſineſs, hee will frequently finde it to bee notably uſeful. Admit the Diviſo[illegible]6, 18, 24, 26, 28, 32, 36, 48, or any other number that may bee parted after the following Order.

See and well conſider the 5th. and 6th. Rules of the 14th. chapter, which are highly uſeful in Trade.

If it bee demanded how many times 18 is in 179802, or how often 18 is to bee found in 179802, which is all one; To anſwer the queſtion, inſtead of dividing by 18, I divide by 2, and by 9, that is, I firſt divide by 2, then that quotient divided by 9, anſwers the queſtion, and ſhews that there is 9989 times 18 in 179802.

```
2|179802
 --------
9| 89901
 --------
    9989
```

So, if the Diviſor bee 24, you may divide by 2 and 12, or 4 and 6, if 28 by 2 and 14, or 4 and 7, if 32 by 2 and 16, or 4 and 8, &c.

If 1920000*d.* are given to bee turned into pounds ſterling, you are to divide by 240, becauſe 20*s.* contain 240*d.* cut off the laſt cipher in the Dividend (for the cipher in the Diviſor)

Diviſor) then divide by 2 and 12, or 6 and 4, which is a very conciſe way for thoſe that cannot divide by 24 at one operation. In like manner, if 80208 were to bee divided by 144, divide by 12 and 12, becauſe 12 times 12 is 144, and the quotient will bee 557. If 6561648 were to bee divided by 81, divide by 9 and 9, becauſe 9 times 9 is 81, and the quotient will bee 81008. If 26496 were to bee divided by 36, divide by 6 and 6, and the quotient will bee 736. A like method may bee obſerved in Multiplication, for 736 multiplied by 6, and that Product by 6 will produce 26496, which is more conciſe, and as effectual, as if the operation had been performed the ordinary way by 36.

2|192000|0

12|96000

8000*l.*

4|192000|0

6|48000

8000

Examples exerciſing the Rules in the five former Chapters.

1 What number is that which ſubſtracted from 324 leaves 17?

324
17
Anſwer. 307

2 What number is that, which ſubſtracted from 307, and added thereto, makes 324

324
307

Anſwer. 17

3 If 17 bee ſubſtracted from 324, and the remainder of 324 bee ſubſtracted from 489, what ſum ſubſtracted from that remainder will leave 100.

324
17
307

489
307
182
100

Anſwer. 82

4 If 17 taken from 324 leave 307, and 307 taken from 489 leave 182, and 100 taken thence leave 82, what number is that out of which when you have taken 17, 324, 307, 489, 182, and 100, leaves 82.

17
324
307
489
182
100
1419
82

Anſwer. 1337

5 What ~~number~~ Sum is that, which taken from 345*l.* will leave 133*l.*—13*s.* 3*d.*—3*q.*

Anſwer 211*l.* 6*s.* 8*d.* 1*q.*

l.	*s.*	*d.*	*q.*
345	09	0	0
133	13	3	3
211	6	8	1
Proof—345	0	0	9

6 If 133*l.* 13*s.* 3*d.* 3*q.* and 211*l.* 6*s.* 8*d.* 1*q.* make 345*l.* what ſumme taken from thence will leave 120*l.* 13*s.* 9*d.*

Anſwer 224*l.* 6*s.* 3*d.*

133	13	3	3
211	6	8	1
345	0	0	0
120	13	9	0
224	6	3	0
Proof 345	0	0	0

(7) 8 Baggs of money containing *viz.*

Were to bee paid to ſeveral perſons, but one of the baggs being loſt, there was but 994*l.* paid, now which of the baggs miſcarried?

Anſwer, The bagge of 50*l.*

1	34
2	50
3	100
4	150
5	160
6	170
7	180
8	200
	1044
	994
	50

8 How many Daies, Hours, and Minutes in 1657 Years?

The *Julian* account making the magnitude of the year to conſiſt of 6 hours more, I multiply 1657 by 6, which makes 9942 hours, to bee added to 14515320, the product of 604805 multiplied by 24.

1657
365

8285
9942
4971

604805 Daies
24

2419220
1209610

14515320 Hours
9942 hours added

14525262 Total of the Hours
60

871515720 Minutes

1657
6

9942

9 An Orchard contains 10 ſquares, and 10 Squares 10
Every Square 10 Trees, 10 Trees 100
Every Tree 10 Limbs 10 Limbs 1000
Every limb 10 branches 10 branches 10000
Every branch 10 Apples 10 Apples 100000
How many Apples are in the Orchard?
Anſwer 100000 Apples.

10 A Roper gave his Daughter for her Portion 12 Ropes. 12 Ropes ——— 12
Every Rope had 12 Knots 12 Knots ——— 144
Every Knot 12 Purſes 12 Purſes ——— 1728
Every Purſe 12 Pence, 12 Pence · 12|207368|d.
2|172|9s.
86
What was the Portion?
Anſwer, 86l. 9s. 8d.

11 How many Barley Corns will reach from St. Albanes to London, 20 Miles?

8 Furlongs
40
320 Perches
33
960
960
10560 half feet
6
63360 Inches
3
190080 Corns in a Mile.
20
3801600 Corns.

If the Queſtion had been, how many Yards,

The

The Anſwer would have been 35200 yards, for there being 1760 yards in a Mile, that number multiplied by 20, would produce

1760
20
35200 yards.

12 If a peece of land bee 325 Perches long, and 578 Perches broad, how many ſquare Perches are contained therein?

578
325
2890
1156
1734
187850

Anſwer 187850

13 There is a ſquare pitch'd field, containing 148 men in rank, and 148 men in file, how many men are in the whole Army?

148
148
1184
592
148
21904

Anſwer 21904

14 How many ſquare feet are contained in the Superficies of that Wall which is 178 yards long, and 28 yards high?

178
28
1424
356
498

Anſwer 4984 yards.

15 Wh

15 What muſt I pay for [illegible]ing of a Wall 32 feet in length, 2 feet in breadth, and 25 foot in height, at 2d. the foot?

Anſwer 160l.

32
2
64
25
320
128
1600
2
2|320|0
160l.

16 If a Cat climbs 17 foot a day from the bottome of a Tree that is 300 foot in length, and comes down 12 foot at night, how long will ſhe be ere ſhe get to the top?

Answer 60 daies.

17
12
300
60

If ſhe were at top and did go downwards 50 foot a day, and upwards again at night 20. ſhe would be 150 daies in getting to the bottome.

17 There are 4 braſs Peeces that ſpend at a ſhot, *viz.*
The firſt 8
The ſecond 6
The third 4
The fourth 2 pounds of Powder.

There is 600l. of powder allowed to theſe 4 Peeces in an aſſault, how many ſhot ſhall each Peece make round, and how many pounds of Powder ought to bee allowed each Peece for its due proportion.

Anſwer, they muſt make 30 ſhot round.

		lb.	
The firſt Peece ſhoots	240	8	600 divided by 20, quotes 30, which ſhews they muſt make 30 ſhot round.
The ſecond ———	180	6	
The Third ———	120	4	
The fourth ———	060	2	
Proof ——	1600	20	

20|2|60|0
30
8

8 times 30, 240, firſt Peece.
6 times 30, 180, ſecond Peece.
4 times 30, 120, third Peece.
2 times 30, 60, fourth Peece.
1600 —— Proof.

18 A Gold-ſmith hath a Maſs of Metal of 40 Ounces, conſiſting of 3 ſorts.

Gold 12 ℥
Silver 12
Copper 16
40

Hee deſires to take out 10 Ounces, and would know how much of each ſort is contained in the 10 Ounces?

Anſwer

Of Gold 3 ℥.	12 by 10—120.
Of Silver 3 ℥.	12 by 10—120.
Of Copper 4.	16 by 10—160.
10 ℥.	

40)12|0

3 Ounces of Gold.

40)12|0

3 Ounces of Silver.

40)16|0

4 Ounces of Copper.

10 Ounces for proof.

19. A Merchant would beſtow in Spices 560*l.* at the following prizes, *viz.* And ſhee would have of one ſort as many pounds as of another, the queſtion is, how many pounds ſhee muſt have of each ſort?

	s.	
Cloves	4	*per lb.*
Mace	7	
Cynnamon	3	
Nutmegs	12	
Pepper	2	
	28	

560
20

28|11200*s.*

|400

Anſwer 400*lb.*

	s.	d.
400 at	4	1600
400 at	7	2800
400 at	3	1200
400 at	12	4800
400 at	2	0800

2|11200 s.

560 l. for proof.

20 If a Tower bee 384 foot high, and a ſixth part bee under earth, and an eighth part under water, how many foot are above ground?

6|384

8| 64

48

Under Earth and Water } 112

Anſwer 272 Above ground—272

Proof—384

CHAP. 6.

Of REDUCTION.

1 REduction (though taught by many as a thing accidental, and not eſſential) requires the notice of many things very neceſſary to bee known.

Reduction changeth Numbers, Weight,

Meaſure, Money, Time, &c. from one Denomination to another, and abbreviates fractions to their leaſt value.

When you would reduce a great ~~number~~ Denomination to a leſs, conſider how many of the leſs make one of the greater, and multiply one by the other, *viz.*

If you would reduce 384*l.* to ſhillings, you finde 20*s.* make 1 pound ſterling, and therefore multiply 384 by 20, and the product gives you

Now if you would reduce that number of ſhillings to pounds, divide by 20, and the Quotient gives you 384*l.* Whence it is apparent, that great Denominations are reduced to leſs by Multiplication, and leſs to great by Diviſion, which will bee more evident by the following Tables and Examples.

```
   384
    20
 ------
 2|7680
 ------
   384
```

	Multiply by		Divide by	
Pounds at one operation reduced	to Shillings	20	Shillings to pounds	20
	to Pence	240	Pence to pounds	240
	to halfpence	480	Halfpence to pounds	480
	to Farthings	960	Farthings to pounds	960

Shillings reduced	to pence	12	Pence to ſhillings	12
	to half-pence	24	Half-pence to ſhil.	24
	to farthings	48	Farthings to ſhil.	48

	Multiply by		Divide by	
Pence	to farthings	4	Farthings to pence	4
Pounds	to Groats	60	Groats to pounds	60
Shillings	to Groats	3	Groats to ſhillings	3
Groats	to Pence	4	Pence to Groats	4
	to Farthings	16	Farthings to Groats	16
Pounds	to Nobles	3	Nobles to pounds	3
	to Marks	3	and divide by	2
Marks	to Pounds	2	and divide by	3
	to Pence	160	Pence to Marks	160
Nobles	to Pence	80	Pence to Nobles	80

2 Though it bee clear by the Tables, that pounds may bee reduced to pence, half-pence or farthings, &c. at one operation, yet (in reſpect the proving of every queſtion in the ſmalleſt numbers, will bee of moſt eaſe) the following Method is obſerved in favour of the Learner.

Reduction of English Coins.

Reduce 987*l.* ſterling to pence, thus. **Example 1.**

Reduction of English money.

l.
987
20

19740 ſhillings
12

39480
19740

12|236880 pence

2|1974|0 ſhillings

987*l.* for proof

Or thus,

987

19740 ſhillings
39480

12|236880 pence

2|1974|0 ſhillings

987*l.*

The Example on the right hand is performed according to the 19th. Example in the 5th. Chapter, but it may bee yet more faceciouſly reſolved.

987
24

3948
1974

236880

Or thus,

987*l.* to pence

2) 1974|0
39480

|236880 pence

Proof 987*l.*

Pounds multiplied and a Cipher added are Shillings.

Shillings [illegible], and a place removed to the right hand are pence: Then you need not take half of 39480 to reduce them to ſhillings again, before you reduce them to pounds, but cut off a Cipher in your ſecond number, and take the half of that, which gives both at one operation; the laſt work will appear moſt conciſe, for there are but 23 (there need be but 20) figures: In the ſecond there are 29: In the firſt 39, which ſhews that moſt tedious, but the Learner may practiſe that way till hee bee perfect.

Example 2. Reduce 987l. to half-pence thus

20

19740 ſhillings

12

23688 0 pence

[illegible]

2

4737[illegible]

The ſumme given multiplied by 20, produceth ſhillings.

The ſhillings [illegible]lied by 12 [illegible]h pence [illegible]ce mu[illegible]

Reduce 987l. to farthings thus. Example 3.

20

19740 ſhillings

12

39480

19740

236880 pence

4

4|947520 farthings

12|236880 pence

2|1974|0 ſhillings

987 pounds

It will not bee amiſs to let the Reader underſtand that

$\frac{1}{2}$ One half.
$\frac{1}{3}$ One third.
$\frac{1}{4}$ One fourth.
$\frac{1}{5}$ One fifth.
$\frac{1}{6}$ Signifies One ſixth.
$\frac{1}{7}$ One ſeventh.
$\frac{1}{8}$ One eighth.
$\frac{1}{9}$ One ninth.
$\frac{1}{10}$ One tenth, &c.

See Numeration of Fractions chap. 7.

Reduce

Pounds doubled and a Cipher added are Shillings.

Shillings doubled, and a place removed to the right hand are pence: Then you need not take half of 39480 to reduce them to ſhillings again, before you reduce them to pounds, but cut off a Cipher in your ſecond number, and take the half of that, which gives 987*l.* at one operation; the laſt work will appear moſt conciſe, for there are but 23 (there need be but 22) figures: In the ſecond there are 29: In the firſt 39, which ſhews that moſt tedious, but the Learner may practiſe that way till hee bee perfect.

Example 2. Reduce 987*l.* to half-pence thus

20

1974 0 ſhillings

12

23688 0 pence

2

2 |47376 0 half-pence

12|23688 0 pence

2 |1974|0 ſhillings

987 pounds

The ſumme given multiplied by 20, produceth ſhillings.

The ſhillings multiplied by 12, produceth pence.

The pence multiplied by 2, produceth half-pence.

The half-pence divided by 2, are turned into pence.

The pence divided by 12, are turned into ſhillings.

The ſhillings divided by 20, are turned into pounds, for proof

Reduce

Example 3.

Reduce 987l. to farthings thus.

```
      20
   ------
    19740 ſhillings
       12
   ------
    39480
   19740
   ------
   236880 pence
        4
   ------
 4|947520 farthings
   ------
12|236880 pence
   ------
 2|1974|0 ſhillings
   ------
     987 pounds
```

It will not bee amiſs to let the Reader underſtand that

$\frac{1}{2}$	Signifies	One half.
$\frac{1}{3}$		One third.
$\frac{1}{4}$		One fourth.
$\frac{1}{5}$		One fifth.
$\frac{1}{6}$		One ſixth.
$\frac{1}{7}$		One ſeventh.
$\frac{1}{8}$		One eighth.
$\frac{1}{9}$		One ninth.
$\frac{1}{10}$		One tenth, &c.

See Numeration of Fractions chap. 7.

Reduce

Or thus.

oz. s. d. q.

987—11—11—3

20

19751 shillings

12

In the last Example the 11*d*. are brought down at once.

39513

19751

237023 pence

4

948095 farthings

4 | 237023 pence

12 | 19751 shillings

987—11—11—3

Example 5. Reduce 90609 Marks English, to pounds, thus,

2

10 3 | 181218 nobles

60406 pounds

3

2 | 181218 nobles

90609 marks

Other

Other Examples.

876540 marks	370780 marks
2	2
3|1753080 nobles	3|741560 nobles
584360 pounds	$247186\frac{2}{3}$ pounds
3	3
2|1753080 nobles	2|741560 nobles
876540 marks	370780 marks
345678 marks	8765432 marks
2	2
3|691356 nobles	3|17530864 nobles
230452 pounds	$5843621\frac{1}{3}$ pounds
3	3
2|691356 nobles	2|17530864 nobles
345678 marks	8765432 marks

In the third Example you finde $\frac{2}{3}$l. remaining, which is a mark, in the fourth $\frac{1}{3}$l. which is a Noble.

Multiply

	Multiply by	Divide by
Reduction of Time	Years to Daies — 365	Daies to Years — 365
	Daies to Hours — 024	Hours to Daies by 024
	Hours to Minutes 060	Minutes to Hours 060

Years	Daies	Hours	Minutes.
998	13	20	11

365

4990

5988

2994

364283 daies

24

1457132

728568

5988 hours added

8748800 hours

60

524928011 Minutes

8748800

5988 hours subtracted.

24)8742812(20 hours

5988 are added for the 6 hours in every year.

998

6

5988

	Years	Daies	Hours	Minutes.
365)364283(	998	13	20	11

3285

3578

3285

2933

2920

13 daies.

Multiply

Multiply by		Divide by	
Tuns to Buts ——	2	Buts to Tuns ——	2
Tuns to hh. ——	4	Hogſheads to Tuns ——	4
Buts to hh. ——	2	Hogſheads to Buts ——	2
hh. to Gallons —	63	Gallons to Hogſheads —	63
Gallons to Pottles —	2	Pottles to Gallons ——	2
Pottles to Quarts —	2	Quarts to Pottles ——	2
Quarts to Pints ——	2	Pints to Quarts ——	2

Reduction of Liquid Meaſure.

Tuns hh. Gal. Pot. qt.
Reduce 130 — 2 — 20 — 1 — 1 — to Pints thus,

4
522 hh.
63
1566
3134
32906 Gallons
2
65813 Pottles
2
131627 Quarts
2
2|263255|1 Pint
2|131627|1 Quart
2|65813|1 Pottle
63|32906 Gal.
4|522|2 hh.
130 Tun.

Reduction of Troy Weight.

Multiply by		Divide by	
Pounds to Ounces	12	Ounces to Pounds	12
Ounces to *dw.*	20	*dw.* to Ounces	20
dw. to *gr*	24	*gr.* to *dw.*	24

lb. ℥. *dw.* *gr.*

Example 1. Troy weight. Reduce 33—7—12—20— to *gr.*

12

403 Ounces — 480 grains in an ounce.

20

8072 *dw.*

24

32288

16146

24|193748 *gr.*—20 — 5760 grains in a pound.

2|807|2 *dw.*—12

12|403 —Ounces

33—7—12—20

Reduce

Example 1.

℥. *dw.* *gr.*
Reduce 83 — 13 — 20 to grains.
20
1673 *dw.*
24
6692
3348
24|40172 *gr.* (20)
2|167|3 *dw.*
83 — 13 — 20

Multiply by		Divide by	
Hundreds to *Quarters*	4	*Quarters* to Hundreds	4
Quarters to Pounds	28	Pounds to *Quarters*	28
Pounds to Ounces	16	Ounces to Pounds	16
Ounces to Drams	8	Drams to Ounces	8
Drams to Scruples	3	Scruples to Drams	3
Scruples to Grains	20	Grains to Scruples	20

C. qu. lb.

Queſtion 1. Reduce 384—3—23 to Ounces thus,

Reduction of Averdupoize weight.

4

1539 quarters
28

12315
3080

43115 pounds
16

258690
43115

16|689840 ounces

28|43115|23 pounds

4|1539|3 quarters

384 C.

Dividing by 16, and 28.

If the Learner bee capable to divide by 16, and 28 at one operation, the work will ſtand decently, proved as in the foregoing Example.

Reduce

lb. ℥. ʒ. ℈.
Reduce 20 — 7 — 5 — 2 to grains thus, Queſtion 2.]
16
127
20
327 ounces
8
2621 drams
3
7865 Scruples
20
2|15730|0 grains
3|7865 (2 ſcruples
8|2621 (5 drams
16|327 (7 ounces
20 pounds

Queſtion 3. In 8 Cheſts of Sugar each 9—3—12 how many pounds?

C. qu. lb.
9—3—12
4

39 quarters
28

314
79

1104 pounds
8 cheſts,

8|8832 pounds neat

28|1104 (12 pounds

4|39|3 quarters

9—3—12

Pounds may bee divided by 112, if the Learner pleaſe to produce 9 *C.* 3 *qu* 12 *lb.* at one operation.

Or thus

C. qu. lb.
9—3—12
8

78—3—12
4

315
28

2522
631

8832 neat

multiply by 8, there being 8 Cheſts, *viz.*

8 times 12 is 96, 12 and go 3 *qu.*

8 times 3 is 24, and 3 is 27. *qu* 3 and go 6 *C.*

8 times 9 is 72, and 6 in mind is 78 *C.* which reduced gives 8832 *lb.* neat. *prout ſupra.*

In 4 Cheſts of Sugar weight, groſs, *viz.*

Queſtion 4.

Tare is the weight of tha wherein any thing is put, a a Bag for Pepper, a Cheſt fo Sugar, &c.

Tare 37 *per* Cheſt what Neat

	C.	*qu.*	*lb.*
A	11	1	19
B	10	3	20
C	11	2	13
D	10	1	17
	44	1	13

C. *qu.* *lb.*
Anſwer 43—0—5

44—1—13
4
177
28
1419
355
4969 groſs
148 Tare ſubſtracted

37 tare *per* Cheſt
4 Cheſts
148 Tare

C. *qu.* *lb.*
112)4821(43—0—5
448
341
336

By the operation you finde 4821 *lb.* neat, which divided by 112, produceth 43 *C.* 0 *qu.* 5 *lb.* neat.

Question 5. Twelve Bags of Pepper weighing groſs, *viz.*

Groſs weight	C. qu. lb.		lb. ℥.
1	3—2—25	Tare	43—08
2	3—1—07		20—07
3	2—0—08		30—09
4	0—3—18		47—10
5	3—0—10		22—13
6	4—2—00		45—14
7	5—3—03		16—08
8	6—2—08		37—09
9	7—0—10		13—11
10	3—0—15		14—12
11	0—3—00		15—09
12	7—3—08		16—08

Groſs—48—3—00 Tare—325—06

4

195

28

1560

390

5460 *lb.* groſs

325—6 ounces Tare.

C. qu. lb. ℥.

112)5134. 10 (45—3—10—10

448

654

560

94

Before

Obſerve.

Before the Learner fall upon thoſe Queſtions of Groſs weight, which are divided by the Aliquot parts of 112 *lb.* 'tis requiſite that hee bee acquainted with the following Table, *Viz.*

112 is a *C.*
84 is 3 quarters of a *C.*
56 is half a *C.*
28 is a quarter of a *C.* that is $\frac{1}{4}$ of 112.
14 is half a quarter, that is, $\frac{1}{8}$ of — 112
07 the half of that is $\frac{1}{16}$ of ———— 112
16 is $\frac{1}{7}$ of ———————— 112

The Allowance for Tare, an Aliquot part of 112.

1 *When the Allowance for Tare is an Aliquot part of* 112, *you may obſerve the order of the following Example*: Where for 14 *per Centum* Tare, I take $\frac{1}{8}$ of the groſs, becauſe 8 times 14 is 112, and you may further obſerve, That in that Diviſion there remains $\frac{1}{8}$ of a *lb.* which in that and ſuch like Queſtions you may caſt away as inconſiderable.

In

Question 6. In 898 *C.* 3 *qu.* 21 *lb.* groſs, Tare 14 *lb.* *per Centum*, how many *C.* neat.

C. *qu.* *lb.*
898—3—21
4

3595 quarters
28

28761
7192

8|100681 pounds groſs

12585 tare to be ſubducted from the groſs

C. *qu.* *lb.*
112|88096 pounds neat (786—2—8. Anſwer.
784
969
896

736
672

64 *lb.* remaining, which is 2 *qu.*—8 *lb.*

C. *qu.* *lb.*
898—3—21 groſs, Tare 16 *per Centum*, how many *C.* neat, in which Queſtion I take $\frac{1}{7}$ part of the groſs, becauſe 7 times 16 is 112.

Queſtion 7.

C. q. lb.
898—3—21
4

3595 quarters
28

28761
7192

7|100681 groſs pounds

14383 tare

C. qu. lb.
112|86298 neat (770—2—2
784

789
784

58

Theſe and all other Examples of like nature may bee more conciſely wrought, as in the Margent, *Viz.*

Firſt, in the place of C. I ſay, once 8 in 8, reſts 0, once 8 in 9, reſts 1, twice 8 in 18, reſts 2 C. which turned into quarters, and added to the 3 quarters (in the rank of quarters) make 11, then once 8 in 11, reſts 3 *qu*, which turned into

C. qu. lb.
8|898—3—21 groſs
112—1—13 tare
786—2—08 neat

into pounds make 84, and added to 21, in the rank of *lb.* make 105, in which number there is 13 times 8, ſo you finde the Tare 112 *C.* 1 *qu.* 13 *lb.* which ſubſtracted from the groſs, leaves 786 *C.* 2 *qu.* 08 *lb.* for the neat weight.

	C.	*q.*	*lb.*	
7	898	3	21	groſs
	128	1	19	tare
	770	2	2	neat

The Tare no Aliquet part of 112.

2 *If the Tare bee not an Aliquot part of* 112, *you may make one or more products, and adde or ſubſtract as you finde occaſion,* Viz.

For 9, 10, 11, 12, 13, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, &c.

You may break or part 9 into 8, and 1, then for 8, divide the groſs weight by 14, and for 1, divide that quotient by 8, both which quotients added together give you the Tare.

You may part 10 into 8 and 2, then for 8 take $\frac{1}{14}$ of the groſs weight, and for 2. $\frac{1}{4}$ of that, that is, divide the groſs weight by 14 (for 8 *lb.* of the Tare) and that product by 4, for the other 2 *lb.* and add both together, and that's the Tare which ſubſtracted from the groſs weight, as before, leaves the neat.

You may part 11 into 8, 2, and 1, then for 8 *lb.* of the Tare, divide the groſs weight by 14, as before, and for 2 *lb.* Tare, divide that product by 4, and for the other 1 *lb.* Tare, divide the ſecond product by 2, and the three quotients added together, is the total of the Tare, which taken from the groſs, leaves the neat weight.

You may break or part 12 into 8 and 4, then for 8 divide the groſs weight by 14, and for 4 take an half of that quotient, both which added together, give you the Tare.

Or you may divide the groſs weight by 8, as admitting the Tare 14 *lb. per C.* then (having taken for 2 *lb.* above your proportion) divide that quotient by 7 (becauſe twice 7 is 14) and the laſt quotient ſubſtracted from the firſt, gives you the Tare.

After the ſame, or ſuch like order, you may break or part the reſt of thoſe numbers, which are not the Aliquot or even parts of 112, as will bee evident by the following Examples.

Queſtion. 8.

In | *C.* *qu.* *lb.*

14 | 140—0—14 groſs, Tare 9 *per Cent.* how many *C.* neat?

8 | 10—0—01 ʒ

| 1—1—00—2

| 11—1—1—2 Tare

128—3—12—14 Neat

140—0—14 groſs weight for proof.

In| C. *qu.* *lb.*
Question 9. 7|140—0—14 groſs, Tare 18 *lb.* *per Cent.* how many C. neat?
8| 20—0—2 ℥
2—2—0—4

22—2—2—4 tare

117—2—11—12 neat

140—0—14—0 groſs weight for proof.

In| C. *qu.* *lb.*
Question 10. 7|140—0—14 groſs, Tare 20 *l.* *per Cent.* how many C. neat?
4| 20—0—02 ℥
5—0—00—8

25—0—02—8 tare

115—0—11—8 neat

140—0—14—0 groſs for proof.

A new Rule to finde the Tare. 3 There is yet another Rule which the Learner may make uſe of to his advantage, in caſe hee bee not able to get through the former, *Viz.*

In

C. qu. lb.
In 140—0—14 groſs, Tare 21 *lb. per Cent.* Queſtion 11.
26—1—03 tare how many C neat?

113—3—11 neat

140—0—14 groſs.

C. *q. lb.*
140—0—16
21

140
2803
C. *qu. lb.*
112|2943 *lb.* tare (26—1—3
|224

703
672

31

Here the Tare being 21*lb. per* C. there muſt needs be 140 times 21, then 16 being $\frac{1}{7}$ of 112, I divide 21 by 7, to finde how much Tare is to bee allowed for the 16*lb.* which I finde to bee 3 *lb.* in all 2943 *lb.* Tare, which divided by 112, gives 26 C. 1 *qu.* 3 *lb.* Tare, as in the Example.

Or thus,

C. *qu.* *lb.*

Queſtion 12. In 140—0—16 groſs, Tare 21 *lb. per Cent.* how many *lb.* neat?

4

560
28

4486
1121

15696 *lb.* groſs
2943 *lb.* tare

112|12753 *lb.* neat
|112

155
112

433
336

97

C. *qu.* *lb.*
140—0—16
21

140
2803

2943 tare

C. *qu.* *lb.*
(113—3—13

Here the demand being to know how many *lb.* neat is in 140 C.—0 *qu.*—16 *lb.* groſs, when I had found the *lb.* neat to bee 12753, there needed to have been no further operation, for the queſtion was anſwered, therefore I had not divided that number by 112, but only to ſhew the agreement of this work with the former.

4 If in Queſtions of like nature there bee any odd quarters or pounds, you are not

(when you multiply to finde the Tare) to bring down the odd quarters, *viz.* in 140 C. 3 qu. 21 *lb.* groſs, Tare 20 *lb.* per Cent. how many *lb.* neat?

The odd quarters and pounds omitted, when the groſs is multiplied to finde the Tare.

Here when I reduce the groſs weight to quarters by 4, I bring down the 3 quarters, and in multiplying by 28, to reduce those quarters to *lb.* I bring down the 21 *lb.* but when I multiply the groſs hundreds by 20, to finde the Tare, I neither bring down the quarters, nor pounds, but when I have multiplied by 20, then for that ½ C. I take 10*lb.* Tare, and for a quarter 5*lb.* (the half of that) then for 14*lb.* 2 ½ (the ½ of that) and for 7*lb.* 1 ¼ (the half of that) all which added together, give 2818 ¾ Tare, which ſubſtracted from the Neat, leaves 12966 ¼ Neat.

C. q. *lb.*
140 — 3 — 21
4
563
28
4505
1128
15785 *lb.* groſs
2818 ¾ tare
12966 ¼ neat

C. q. *lb.*
140 — 3 — 21
20
2800
10
5
2 ½
1 ¼
2818 ¾

1973

15785
1973
282
464
2 19

I Mr.

Record an Antient Author, fol. 302, ſaith, there are neceſſary brief Rules for finding of Trets, and caſting of Cheſts of Sugar, &c. which (for that it was a myſtery) hee omitted; but if any did lack inſtruction that way, they ſhould finde him ready to pleaſure them.

Though I have formerly ſhewed ſeveral waies for finding Trets and Tares, which were not handled by any Author I have met withall, yet the laſt way I have omitted (for ſome reaſons to my ſelf) as well as ſome of thoſe that follow, but I conceive I have now unfolded that myſtery, which that Author would not communicate, for the benefit of the Learner, and that if any one want inſtruction therein, if hee conſult this book, hee may inable himſelf to reſolve all queſtions of that nature with dexterous facility.

In 6 Baggs of Pepper weighing groſs 384 C.—3 qrs—16 lb. Tare 14 lb. per Bagge, and 4 lb. per 104 lb. Tret, how many C. neat?

C. q. lb.
384—3—16
4

1539
28

12318
3079

43108 lb. groſs
84 tare

43024 ſubtil
1654 tret

28|41370 neat 1
1

4|1477
C. q. lb.
369—1—14 neat.

26)43024(1654 $\frac{20}{26}|\frac{10}{13}$
26

170
156

142
130

124
104

20

The Tare ſubſtracted from the groſs, leaves 43024 lb. ſubtil, to bee divided by 26 (becauſe 4 times 26 makes 104) to finde the Tret, which is 1654, ſubſtract that from the ſubtil weight, and obſerve the order of the work, and the Anſwer will be C. q. lb.
369—1—14 neat.

Record an Antient Author, fol. 302, ſaith, there are neceſſary brief Rules for finding of Trets, and caſting of Cheſts of Sugar, &c. which (for that it was a myſtery) hee omitted; but if any did lack inſtruction that way, they ſhould finde him ready to pleaſure them.

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In 6 Baggs of Pepper weighing groſs 384 C.—3 q.—16 lb. Tare 14 lb. per Bagge, and 4 lb. per 104 lb. Tret, how many C. neat?

```
    C.  q.  lb.
   384—3—16
      4
  ------
   1539
     28
  ------                26)43024(1654 20/26|10/13
  12318                    26
  3079                    ----
 -------                   170
 43108 lb. groſs           156
    84 tare               ----
 -------                    142
 43024 ſubtil               130
  1654 tret               ----
 -------                     124
28|41370 neat                104
 -------                    ----
 4|1477                        20
  ------C.  q.  lb.
      369—1—14 neat.
```

The Tare ſubſtracted from the groſs, leaves 43024 lb. ſubtil, to bee divided by 26 (becauſe 4 times 26 makes 104) to finde the Tret, which is 1654, ſubſtract that from the ſubtil weight, and obſerve the order of the work, and the Anſwer will be C. q. lb.

369—1—14 neat.

The pounds neat, *Viz.* 41370 divided by 112, gives 369, and 42 *lb.* remains, which is $\frac{1}{4}$, and 14 *lb.* So the Learner may take his choice.

Question 14.

Tare 14 *lb.* per *Cent.* and 4 *lb.* per 104 tret, how many C. neat?

C. *q.* *lb.*
Anſw.—323—3—8

C. *q.* *lb.*
In |384—3—14 groſs
8 | 48—0—12 tare

336—3—02 ſubtil
4

1347
28

10778
2694

37718
1450 tret

C. *q.* *lb.*
112|36268 neat (323—3—8
336

266
224

428
336

92

26) 37718 (1450 $\frac{9}{13}$
26

117
104

131
130

$\frac{18}{26}$ | $\frac{9}{13}$.

In dividing the groſs weight by 8, you finde $\frac{2}{8}$ (that is $\frac{1}{4}$) remains, and dividing the ſubtile weight by 26 (to know the Tret) you finde $\frac{9}{13}$, which in Queſtions of like nature are commonly caſt away.

The following Order is yet more ready, but the Learner will the better underſtand that by being perfect in the former.

Queſt. 15.

In| C. q. lb.
7|989—3—16 groſs weight
2|141—1—18 $\frac{2}{7}$
70—2—23
212—0—13 tare
777—3—03 ſubtil
29—3—18 tret
747—3—13 neat

Tare 24 *per Cent.* and 4 *per* 104 Tret. how much neat weight?

Obſerve, that to take the tare from the groſs weight (the Tare being 24 *per Centum*) I part 24 into 16 and 8, then for 16 I take $\frac{1}{7}$ of the groſs weight, and for 8. $\frac{1}{2}$ of that, which makes 212 C.—0 *qu.*—13 *lb.* Tare, which ſubſtracted from the groſs, leaves 777 C.—3 *qu.*—03 *lb.* ſubtile, which I divide by 26, the order of which Diviſion deſerves obſervation, *viz.* in the 777 C. I finde 29 C. the 23 remaining, I multiply by 4, which (with the 3 quarters in the rank of quarters brought

down

down and added to the Product) make 95; which divided by 26, gives 3 quarters, and there remaines 17, which multiplied by 28, and the 3 brought down from the place of pounds, and added to the product, gives 479, that divided by 26, gives 18 *lb.* the 11 remaining multiplied by 16, makes 176, which divided by 26, gives 6 Ounces, and $\frac{10}{13}$, which ſubducted from the groſs, leaves 747 C.—3 *qu.*—13 *lb.* neat.

I omit the Ounces in ſubſtracting the Tret from the ſubtile, becauſe Merchants are not ſo critically conciſe, as to inſiſt upon the fractional part of a pound.

C. q. lb. C.
(26) 777-3-13 (29 $\frac{23}{26}$
52
257
234
23
4
(26) 95 (3 qu. $\frac{17}{26}$
78
17
28
139
34
(26) 479 (18 lb.
26
219
208
11
16
(26) 176 (6 $\frac{20}{26}$|$\frac{10}{13}$.
156
20

The laſt work proved by one of the former Methods, *Viz.*

```
       C.  q.  lb.
       989—3—16 groſs.   Tare and Tret as in the for-
         4                     mer Queſtion.
     ______
       3959
         28
     ______
      31678
       7919
     ______
   7|110868 groſs pounds      26 (87111 (3350 11/26 lb.
     ______                         ....      which is
   2|15838 2/7                       78       6 10/13 ℥.
      7919                         ______
     ______                            91
      23757 tare                       78
     ______                          ______
      87111 ſubtil                      131
       3350 tret                        130
     ______        C.  q.  lb.       ______
  112)83761 neat (747—3—13               11
        ...
        784
     ______
        536
        448
     ______
        881
        784
     ______
         97
```

How many C. Tuns and Quarters

Quest. 16. In | *lb.* C. *q.* *lb.*

112|56874 (507—3—6

560

874

784

90

C. *qu.* *lb.*

25 Tuns 7—3—6

80

2031 quarters

28

16254

4062

56874 *lb.* for proof.

Divide 56874 *lb.* by 112, and it makes 507 C.—3 *qu.*—6 *lb.* 507 C. divided by 20 (20 C. being a Tun) makes 25 Tuns, 7 C. 3 *qu.* 6 *lb.* 25 multiplied by 80 (80 *qu.* being a Tun) and bring down 31 (for the 7 C. and 3 *qu.*) makes 2031 *qu.* 2031 *qu.* multiplied by 28, the 6 *lb.* being brought down, makes 56874 *lb.* for proof.

In 4876 *lb.* at 16 ℥ how many *lb.* at 24 ℥? Queſt. 17.

```
   4876
     16
  ------
  29256
  4876
  ------
24)78016      (3250 lb. 16/24 | 2/3 at 24 ℥.
                 24
   72         ---------
  -----         13006
    60          6501
    48        ---------
  -----       16)78016 (4876 lb. for proof
    121
    120          64
  -----        -----
      16          140
                  128
                -----
                   121
                   112
                  -----
                     96
```

If the Learner bee capable of multiplying and dividing by 16 and 24 at one operation, the work will ſtand more decently, as appears by the ſame Example wrought after that Order.

4876
16

24|78016

3250 $\frac{16}{24}$ *lb.* at 24 ʒ to the *lb.*
24

16|78016

4876 for proof.

Queſt. 18. In 4879 C. at 100 *lb. per* C. how many at 112 *per* C.

112)487900 (4356 C. $\frac{28}{112}$|$\frac{14}{56}$|$\frac{7}{28}$|$\frac{1}{4}$ at 112 *lb. per* C.

448

399
336

630
560

700
672

28

4356
112

8712
4356
4356

100|4879|00 for proof.

In

Oaks lb. ʒ.

In 4876 [illegible] how many lb. and C. Quest. 13.

43 |16 weight at in 112 lb. to the C.

14628 43

19504

16|209668 ʒ

112|13104 (117 C. [illegible]

112

190

112

784

784

C.

117

112

234

117

117

13104 lb.

16ʒ

43|209668 (4876 Oaks for proof.

172

376

344

326

301

258

258

In multiplying 13104 by 16, remember to add 4 to the product which remained upon the dividing of 209668 by 16.

Rottalves *lb.* ℥. *lb.*

Quest. 20. In 4873 at 4—13 how many Oaks at 2—1

```
      77   16                         16
                                      --
    34111                             43 ℥
   34111
   ------
43)375221 ℥         (8726 3/43 Oaks
   344                    43
   ---               -----
    312               26181
    301               34904
    ---              ------
     112          77)375221(4873 Rottalves
      86                        for proof,
     ---              308
     261              ---
     258               672
     ---               616
       3               ---
                        562
                        539
                        ---
                         231
                         231
                         ---
```

Remember to bring down the 3 which remained upon the Division.

In

Queſt. 21. Rottal. *lb.* ℥.

In 4895 at 4—13 how many Bags each weight 34 Oaks at 2*lb*, 2—11 ℥?

77 16

34265 77 43

34265 34

1462|376915(257 $\frac{1181}{1462}$ 172

2924 129

8451 1462 Remember to

7310 257 bring down the 1181, which remained upon the Diviſion of 376915 by 1462.

11415 10235

10234 7318

1181 2925

77)376915 (4895 Rottalves]

308

689

616

731

693

385

385

4 Nails

Reduction of Meaſures.

4 Nails is a Quarter.
4 Quarters is a Yard.
5 Quarters an Ell Engliſh.
3 Quarters an Ell Flemmiſh.

Queſt. [illegible] In 4876 Yards, how many Nails?
16
16|78016 Nails.
4876 Yards for proof.

Queſt. [illegible] In 5768 Ells, how many Yards Engliſh?
5
4|28840 Nails
7210 Yards
4
5|28840 Nails
5768 Ells for proof.

Multiply the Meaſure given by the Nails of the ſaid Meaſure, and divide the Product by the number of Nails which are in that Meaſure unto which you would reduce them, *Viz.*

How many Engliſh Yards in 300 Flemmiſh Ells? Queſt. 3.
Anſwer 225
12 Nails in the Flemmiſh Ell
Nails in an English yard 16|3600 Nails
225 English Yards

How many Flemmiſh Ells in 225 Engliſh Yards? Queſt. 4.
Anſwer 300
16 Nails in the Engliſh yard
Nails in a Flemmiſh Ell 12|3600 Nails.
300 Flemmiſh Ells

More concisely thus,
300 Flemmiſh Ells
3
4|900 quarters
225 Engliſh Yards
4
3|900 quarters
300 Flemmiſh Ells.

See the obſervation upon the Table of Silk and Venice weight, in the 15th. Rule of the 14th. Chapter.

Or thus,

Take ½ and ¼ of Flemmish Ells, and both the Quotients added, are English yards, or take ¼ of Flemmish Ells, and substract it from the number of Flemmish Ells given, and the remains are English Yards; so 75 the ¼ of 300 substracted from thence, leaves 225.

Flemmish Ells 300

4|300

75

English Yards 3|225

75

Flemmish Ells 300

Also take ⅓ of English yards, and add that to the number of English yards given, and the total is Flemmish Ells.

Quest. 5. In 4869 Ells English, how many Ells Flemmish?

3|24345

8115 Ells Flemmish

5|24345

4869 Ells English

In 4876 Ells, how many Aulnes 100 Ells being 120 Aulnes? Queſt. 6.

```
       120
   ─────────────
100|5851|20          Anſwer 5851 20/100 | 2/10 | 1/5
   ─────────────
120|58512|0
   ─────────────
     4876 for proof.
```

4876 multiplied by 12, and a cipher added, makes 585120, which divided by 100, gives 5851 $\frac{20}{100}$, then 5851 multiplied by 100 (and 20 the remains added) makes 585120, which divided by 120 (that is, by 12, a cipher being cut off both in the Diviſor and Dividend) makes 4876 Ells for proof.

Queſt. 7.

In 4987 Ells, how many peeces each containing 47 yards?

```
In 4987                                         47 yards?
      5                                          4
 ─────────                                     ─────
188)24935 qu. (132 119/188 peeces.              188 qu.
    188              188
 ─────────        ─────────
     613             1065
     564            1057
 ─────────           133
     495          ─────────
     376          5|24935
 ─────────        ─────────
     119           4987 Ells for proof.
```

Orthus,

```
   4987
      5
 --------
4|24935 qu.
 --------
47|6233 3/4             (132 peeces 29/47
   47                      47
 --------               ------
   153                     933
   141                    530
 --------               ------
    123                   6233
     94                      4
 --------               ---------
     29                5|24935
                        --------
                          4987
                        --------
```

Add the $\frac{3}{4}$ which remained upon dividing the qrs. by 4.

29 and $\frac{3}{4}$ divided by 47, according to the 4th. Example in the 12th. Chapter, will prove the fractional part of the Example agreeable in both operations.

In

Queſt. 8.

In 487 peeces each cont. 45 yards, how many peeces, each cont. 56 Ells?

186

3896
487

28|8766|0 qrs.

84

36
28

86
84

2

4

186

5

280

(313 |$\frac{2}{28}$|$\frac{1}{14}$| peeces
280

25060 Bring down the
626 20 remaining.

18|8766| 0. (487 peece
72

156
144

126
126

Anſwer 313 $\frac{1}{14}$
peeces each cont.
56 Ells.

Anr 313 $\frac{1}{14}$ peeces [illegible]
containing
56 ells

K 2 Or.

Or thus,

487 peeces
45 yards

2435
1948

21915 yards
4

5|87660 qrs.

56|17532 Ells

168

73
56

172
168

4

(313 $\frac{4}{56}$|$\frac{1}{14}$ peeces
56

1878
1565

17532 Ells
5

4|87660

45|21915 (487 peeces for proof.
180

391
360

315
315

CHAP.

CHAP. 7.

Of FRACTIONS.

Numeration or Notation of Fractions.

THe ſame parts of Arithmetick which have been wrought by whole numbers in the former Chapters, are likewiſe to be performed by broken numbers, otherwiſe called parts or Fractions.

1 *The noting or writing of a Fraction is done in two numbers or terms, with a line of ſeparation thus* [illegible], *the upper term being commonly called the Numerator, the lower the Denominator,* as in the ſecond Example in the IIII. Rule of the 5th. Chapter, which terms are uſually written with leſs Characters than whole numbers.

How to write a Fraction.

2 *An Unite, or Number repreſenting an Unite, may bee broken into 2 or more parts, if into 2, then each of the parts is called one ſecond or half, if into 3, then each part is called a third, and two of them are called two thirds;* and the like may bee underſtood, if it were broken into any other parts.

An Unite broken into parts.

3 *The Numerator denotes how many parts of an Unite a Fraction containeth; and the Denominator, the name and kind of the parts whereinto the Unite is divided, by which the truth and certainty of the parts repreſented may appear.*

What the Numerator ſignifies.

Let $\frac{7}{8}$ ſignifie ſome part of a pound ſterling, or 20*s.* and the Denominator declares 20*s.* to bee divided into 8 parts; and the Numerator how many of thoſe parts the fraction containeth (*viz.* 7) and between them both a certain portion of a pound ſterling, or 20*s.* is truly expreſſed, which is 17*s.* 6*d.* every eighth part being half a Crown, or 2*s.* 6*d.*

If it were $\frac{7}{8}$ of a ſhilling, it were 10 *d.* $\frac{1}{2}$, if $\frac{7}{8}$ of a *lb.* Troy 10 ℥ $\frac{1}{2}$, if $\frac{7}{8}$ of a *lb.* Averdupoize 14 ℥.

4 *Fractions are proper, improper, mixt or compounded, and thus diſtinguiſhed.*

A proper Fraction.

5 *The Numerator of a proper Fraction is leſs than the Denominator, and repreſents but part of an intire thing, as before.*

An improper Fraction.

6 *An improper Fraction hath a Numerator greater than its Denominator,* as $\frac{9}{3}$ which contains 3 Integers, or $\frac{9}{4}$, which contains 2 Integers, and $\frac{1}{4}$.

7 *A mixt number hath 2 parts, the one whole, the other broken,* as $3\frac{1}{8}$, $12\frac{8}{15}$, &c.

See the Rule following, and the 10th. Rule of the 8 Chapter.

8 *A compound broken Number, commonly called a Fraction of a Fraction, conſiſts of more Numerators and Denominators than one and is known by the word (of) placed between the parts,* as $\frac{1}{4}$ of $\frac{2}{3}$, &c.

The things expreſſed by broken numbers.

9 *The things expreſſed by broken numbers are principally the parts or Fractions of Money, Weight, Meaſure, Time, &c. Shillings in reſpect of a Pound, Pence in reſpect of a Shilling, Farthings in reſpect of a Penny, Quarters in reſpect of Hundreds. Pounds in reſpect of Quarters, Ounces in reſpect of Pounds, and Drams in reſpect of Ounces, &c. are ſaid to be Fractions,*

9 *s.* is $\frac{9}{20}$ of a Pound;
11 *d.* is $\frac{11}{12}$ of $\frac{1}{20}$ of a Pound;
3 *q.* is $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$ of a Pound, &c.

CHAP. 8.

Reduction of Fractions.

1 THe value of a proper Fraction may bee thus found, multiply the Numerator by the number of parts of the next inferiour or lower Denomination (which are equal to the Integer) divide the Product by the Denominator, and the Quotient gives the value of that Fraction in the next inferiour Denomination; *As by the laſt Example in the 27th Rule of the 5th Chapter, *viz.* 37354 *l.* is there ſuppoſed to be divided amongſt 68 men, which gives each mans proportion to bee 549 $\frac{22}{68}$ *l.* Now to finde the value of $\frac{22}{68}$ *l.* according to the Rules aforegoing I multiply the Numerator 22 by 20 which is the number of parts of the next inferiour Denomination (20 *s.* making a pound) and divide by the Denominator, as in the order of that queſtion (which is very plainly performed) and finde $\frac{22}{68}$ to bee 6 *s.* 5 *d.* 2 $\frac{40}{68}$ *q.* In that Example, becauſe the ſumme propoſed to bee divided is pounds, I multiply the remains upon my Diviſion (that is the Numerator) by 20, and divide by the Denominator, (which was my Diviſor) to diſcover the ſhillings,

To finde the value of a proper fraction.

lings, and thoſe Remains by 12, to diſcover the pence, and thoſe Remains by 4, to diſcover the farthings: So, if it had been $\frac{22}{68}$ C. groſs weight, I muſt have multiplied the Remains by 4 to finde the Quarters, then by 28 to finde the pounds, and by 16 to finde the Ounces, &c. *Viz.*

$\frac{22}{68}$ of an C. groſs weight.

By the Order of this operation, I finde $\frac{22}{68}$ of C. weight to bee 1 *qu.* 8 *lb.* 3 ℥. $\frac{52}{68}$ of an ℥.

The value of a fraction in Troy weight will bee found by multiplying the Numerator by 4, to finde the quarters, the remains by 25 to finde the pounds, and the laſt remains by 12, to finde the ℥, &c. See the ſecond Example in Diviſion of decimals in the 22 Chapter, where $\frac{925}{1000}$ C. is reduced to 3 *qu.* 20 *lb.*

```
     22
      4
    ----
68) 88 (1 qr.
    68
    ----
     20
     28
    ----
68) 560 (8 lb.
    544
    ----
     16
     16
    ----
68) 256 (3 ℥. 52/68
    204
    ----
     52
```

When the Numerator and Denominator are even numbers.

2 *When the Numerator and Denominator are even numbers, they may bee meaſured or divided as in the firſt, ſecond and third Examples of the 5th. Chapter, Viz. Take the half of the*

Numerator for a new Numerator, and half of the Denominator for a new Denominator: So in the fractions of the laſt Example $\frac{22}{68}$ might have been abbreviated to $\frac{11}{34}$, for the half of 22 is 11, and the half of 68 is 34; And $\frac{52}{68}$ to $\frac{13}{17}$, for the half of 52 is 26, and the half of 26 is 13 for a new Numerator, and the half of 68 is 34, and the half of that 17 for a new Denominatior; And as $\frac{11}{34}$ is equivalent to $\frac{22}{68}$, So is $\frac{13}{17}$ to $\frac{52}{68}$, as may bee proved by the firſt Rule of this Chapter; likewiſe $\frac{20}{34}$ may bee reduced to $\frac{10}{17}$, which is equivalent to $\frac{40}{68}$.

When there are ciphers in the Numerator and Denominator.

3 *When the Numerator and Denominator do each of them end with one or more cipHers, cut off equal ciphers in both;* ſo will the fraction bee reduced into leſſer terms, and the value thereof bee often diſcovered without the help of the firſt Rule, as in the 28th. Rule of the 5th. Chapter, where you finde the fraction $\frac{200}{1000}$ *l.* firſt reduced to $\frac{2}{10}$, by cutting off equal ciphers, and next by the ſecond Rule of this Chapter to $\frac{1}{5}$, which without help of the firſt Rule, is known to bee 4*s.* and that 5678200 *l.* being divided amongſt 1000 men, each mans proportion would be 5678*l.* 4*s.*

When a number may be eſpied to divide a Fraction.

4 *Whenſoever you can ſpy a number, which will at one or more times exactly meaſure the fraction, you may thereby divide the Numerator and Denominator:* So $\frac{16}{48}$ *l.* may bee reduced into $\frac{1}{3}$, for once 16 in 16 for a new Numerator, and 3 times 16 in 84 for a new Denominator; which is $\frac{1}{3}$ *l.* (*viz.* 6*s.* 8*d.*) and is [illegible]

equivalent to [illegible]. Again [illegible] *li.* may bee reduced firſt into [illegible] by dividing the Numerator and Denominator by 12, and next into $\frac{1}{12}$ which is 20 *d.* and is equal to [illegible] *li.*

5 *Many times the Numerators and Denominators ending in 1, 3, 5, 7, 9, &c. may bee meaſured by ſome one or other of the ſame, or ſome other numbers,* viz.

Example 1. [illegible] meaſured by 3 gives [illegible]

Example 2. [illegible] meaſured by 9 gives [illegible].

Example 3. [illegible] meaſured by 9 gives [illegible], which meaſured by 3, gives $\frac{6}{7}$, ſo is $\frac{6}{7}$ equivalent to [illegible]. Or [illegible] may bee reduced to $\frac{6}{7}$ by 9 [illegible] and [illegible] by 7 and 5, will bee reduced to $\frac{6}{7}$.

I know, perſons converſant in Arithmetick cannot bee to ſeek of a number whereby fractions may bee reduced at firſt ſight, but ſometimes to a Learner broken numbers fall out crabbedly, and the value of a fraction is moſt eaſily found when it is reduced to the leaſt Denomination, therefore that the beginner may not bee gravelled, I think it fit to inſert all thoſe Rules that may any way make for his Advantage.

To finde the greateſt common meaſure of a Fraction.

6 *Two numbers being given, the greateſt number, which will divide each of the numbers given, without leaving a remainder, may bee found in this manner,* viz. *Divide the greater number by the leſs (the Denominator by the Numerator) and by the Remains divide the Diviſor, and ſo continue dividing the laſt Diviſor by the Remainders, until there bee no Remainder*

(neglecting the Quotient) or that the Remainder bee 1. *If the Remainder bee* 1, *the fractions are in their lowest Denomination, but if nothing remain, the laſt Diviſor is the greateſt common meaſure of both terms, by which both being divided, and the Quotient placed like a fraction, that fraction ſhall bee equal to the former fraction, and in the leaſt terms,* viz. $\frac{277}{299}$ *l.*

Dividing the Numerator by the Denominator (the greater number by the leſs) and proceeding according to the Rule, you finde 1 remains, which ſheweth the fraction cannot bee written with leſs terms, therefore in ſuch caſe, if it bee not to bee reduced to a leſs number, you cannot proceed otherwiſe to know the value thereof than by the firſt Rule in this Chapter, by which you will finde $\frac{277}{299}$ *l.* to be 18 *s.* 7*d.* $\frac{101}{299}$*d.* or $\frac{411}{299}$*q.* $\frac{5789}{101000}$ the fraction remaining upon the Example in the 29th. Rule of the 5th. Chapter, divided in like manner, will ſhew that it cannot bee reduced to leſs terms, but by the firſt Rule of this Chapter, the value will bee found 6*d.* 3 $\frac{273}{311}$ *q.* whence it appears

```
277)299(1
    277
    ---
     22

 22)277(12
    22
    ---
    57
    44
    ---
    13

 13)22(1
    13
    ---
     9

  9)13(1
     9
    ---
     4

  4)9(2
    8
    ---
    1
```

Example 1.

The Numerator divided by the Denominator (a greater number by a leſs.)

appears (by the ſame Chapter, Rule, and Example) that if 3456789 were given to bee divided between 203085 men, each mans proportion would bee 17 [illegible] *l.* which is 17*l.* 0*s.* 6*d.* 3 [illegible] *q.*

Example 2. The fraction $\frac{1564}{1676}$ by obſerving the order of this Rule, is reduced to $\frac{17}{18}$, for the greateſt common meaſure is found 92, by which the Numerator being divided, the quotient gives 17 for a new Numerator, and the Denominator divided thereby, gives 18 for a new Denominator, but the fraction may by the ſecond Rule bee abbreviated or reduced to $\frac{391}{414}$, which is beſt, and then by this Rule 23 will bee found the greateſt common meaſure which (as before) gives $\frac{17}{18}$.

Or you may by 2 abbreviate $\frac{1564}{1676}$ to $\frac{782}{828}$, then by 2 abbreviate 92 to 46, and divide as before, and that produceth $\frac{17}{18}$.

Or abbreviate $\frac{782}{828}$ again by 2 to $\frac{391}{414}$, and 46 to 23, and each of thoſe waies produce $\frac{17}{18}$ the fraction required, which admitted to bee $\frac{17}{18}$ of a *lb.* Troy, would by the firſt Rule bee found 11 $\frac{1}{3}$ ℥.

To reduce a mixt number into an improper Fraction.

7 *To reduce a mixt number to an improper Fraction equivalent unto the mixt number, multiply the whole number by the Denominator of the Fraction, and unto the Product adde the Numerator; ſo is the Summe, the Numerator of an improper fraction, whoſe Denominator is the ſame with that of the fraction annexed.* So 4 $\frac{5}{6}$ will bee reduced into the improper fraction $\frac{29}{6}$, for the Denominator 6 multiplied

by the whole number 4, and 5 the Numerator added, the ſumme is 29 for a new Numerator, which placed over the Denominator 6, gives the improper fraction $\frac{29}{6}$ which is equal to 4 $\frac{5}{6}$, as appears by the Rule following. 5 *l.* 19 *s.* is $\frac{119}{20}$ *l.* and 5 $\frac{19}{20}$ *l.* will bee $\frac{119}{20}$.

8. *To reduce an improper fraction into a whole or mixt number, divide the Numerator by the Denominator, and the Quotient is the whole number, or the mixt number ſought:* So $\frac{29}{6}$ in the Rule aforegoing, will be reduced into the mixt number 4 $\frac{5}{6}$, for 29 divided by 6 gives 4 $\frac{5}{6}$, alſo the improper fraction $\frac{88}{4}$, will bee reduced into the whole number 22, and $\frac{119}{20}$ into 5 *l.* 19 *s.*

To reduce an improper fraction into a whole or mixt number.

9. *To reduce a whole number into an improper fraction, place the whole number given as Numerator, and* 1 *as Denominator;* So 20 Integers will bee reduced into the improper Fraction $\frac{20}{1}$, and 12 into $\frac{12}{1}$.

To reduce a whole number into an improper Fraction.

10. *To reduce a Fractien of a Fraction into a ſingle Fraction, multiply all the Numerators continually for a new Numerator, and all the Denominators continually for a new Denominator:* So $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ is $\frac{24}{60}$, for 2 times 3 is 6, and 4 times 6 is 24 for a new Numerator, and 3 times 4 is 12, and 5 times 12 is 60 for a new Denominator, and $\frac{24}{60}$ will bee reduced to $\frac{2}{5}$, by the ſecond or fourth Rule of this Chapter.

To reduce a compound fraction to a ſingle Fraction.

An

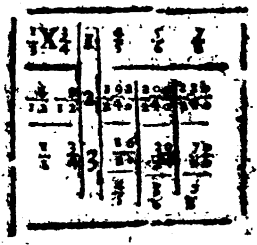
An Illuſtration or Proof.

Let the Unity be 1 *l.* ſterling, then
$\frac{4}{5}$ *l.* is ——— 16 *s.*
$\frac{3}{4}$ thereof is — 12, and
$\frac{2}{3}$ of that is —— 8, which is equal to $\frac{2}{5}$ *l.*

To reduce fractions of unequal Denominations.

11 *To reduce Fractions that have unequal Denominators, into others that are equal both in Numerator and Denominators, multiply every particular Numerator croſſwiſe into all the Denominators, except its own, for new Numerators, then multiply the Denominators continually, and the Product is a common Denominator.*

Example 1. Firſt, $\frac{1}{3}$ and $\frac{3}{4}$ produce $\frac{4}{12}$ and $\frac{9}{12}$, for 1 the Numerator of the firſt multiplied into 4 the Denominator of the ſecond, gives 4 for Numerator of the firſt, and 3 the Numerator of the ſecond multiplied into 3, the Denominator of the firſt, gives 9, for Numerator of the ſecond, then 3 and 4 the Denominators multiplied together, the Product is 12 for a common Denominator to both the Fractions.



Example 2. 4 times 6 is 24, and 8 times 24 is 192.

5 times 5 is 25, and 8 times 25 is 200.
7 times 6 is 42, and 5 times 42 is 210.

So the 3 new Numerators are 192, 200, 210, then 5 times 6 is 30, and 8 times 30 is 240 for a common Denominator. Now all theſe are equal in proportion to the value of the firſt, and by the former Rules may bée reduced to their firſt predicament, as is evident by the Table.

How $\frac{2}{3}$ and $\frac{3}{4}$ are reduced to $\frac{4}{12}$ and $\frac{9}{12}$, and how again reduced to $\frac{2}{3}$ and $\frac{3}{4}$, is very perſpicuous, yet it will not bee amiſs to ſhew the Learner the order of the ſecond Work.

$\frac{192}{240}$ divided by 12 gives $\frac{16}{20}$ $\left\{\begin{array}{l}4 \text{ times } 4 \text{ in } 16\\ 5 \text{ times } 4 \text{ in } 20\end{array}\right\}\frac{4}{5}$

$\frac{200}{240}$ equal ciphers cut off, give $\frac{20}{24}$ $\left\{\begin{array}{l}5 \text{ times } 4 \text{ in } 20\\ 6 \text{ times } 4 \text{ in } 24\end{array}\right\}\frac{5}{6}$

$\frac{210}{240}$ divided by 3 gives $\frac{70}{80}$ equal ciphers cut off $\frac{7}{8}$

Or they might have been reduced at one operation.

$\left.\begin{array}{l}4 \text{ times } 48 \text{ in } 192\\ 5 \text{ times } 48 \text{ in } 240\end{array}\right\}\frac{4}{5}$

$\left.\begin{array}{l}5 \text{ times } 40 \text{ in } 200\\ 6 \text{ times } 40 \text{ in } 240\end{array}\right\}\frac{5}{6}$

7 times 30 in 210 } 7
8 times 30 in 240 } 8 Or, the Numerators of theſe Fractions may bee added like whole numbers; *Viz.*

192
So you finde the 200
Fraction 210

$\frac{602}{240}$ or $\frac{301}{120}$ $\frac{602}{240}$ | $\frac{301}{120}$ |

An Illuſtration or Proof.

Let the Unity bee a Pound ſterling.

$\frac{4}{5}$ whereof is 16 *s.*
$\frac{5}{6}$ is ———— 16 — 8 *d.*
$\frac{7}{8}$ is ———— 17 — 6.
50 — 2

Now $\frac{602}{240}$ $\frac{301}{120}$ will bee found equivalent thereunto by the firſt Rule of this Chapter to bee 2 *l.* 10 *s.* 2 *d.* for proof of the work.

By the ſeveral Rules and Examples in the 6th. Chapter, the meaneſt capacity cannot but apprehend how Integers are reduced from one Denomination to another, *viz.*

1 Integers reduced from one Species or Denomination to another into parts required.

2 *Integers* of any Denomination reduced into *Integers* of a leſs Species, and *Integers* of the leaſt reduced into the greateſt Deno-

mination, the like of mixt numbers, &c.

By which Rules are underſtood the converting of one Species into another, in relation unto money, weight, meaſure, and all other things whoſe leſs parts are uſually known, all which parts are Integers, in reſpect of their own Denomination, place or column; but in relation to the next greater Denomination, they are no more than fractions, as a farthing in reſpect of its place is an Integer, but in relation to a penny 'tis a fraction of that, as $\frac{1}{4}$, and ſo are pence to ſhillings, and ſhillings to pounds, and all other diviſible things in the world.

See the Marginal note upon the 8th. Rule in the 7th. Chapter,

In reducing 25 *s.* 35 groats, 7 *d.* and $\frac{3}{4}$ *q.* into a ſingle fraction, you are firſt to conſider (from what was laſt ſaid) that Queſtions of this kinde are but fractions of fractions, and ſo accordingly to bee reduced into any greater Denomination.

Example 3. An Integer of any Denomination reduced into a ſingle fraction of a greater.

Therefore add the ſeveral Summs, *Viz.*

	l.	*s.*	*d.*
	1	5	0
35 Groats make	0	11	8
	0	0	7 $\frac{3}{4}$
Which make	1	17	3 $\frac{3}{4}$

Now by the 7th. Rule of this chapter, you finde 1*l.* 17*s.* to bee $\frac{37}{20}$, and by the 8th. Rule of the 7th. Chapter, you finde 3*d.* to bee $\frac{3}{12}$ of $\frac{1}{20}$, and 3*q.* to bee $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$, then by

the

the 10th Rule of this Chapter, $\frac{3}{12}$ of $\frac{1}{20}$ is found $\frac{3}{240}$, and $\frac{1}{4}$ of $\frac{1}{12}$ of $\frac{3}{20}$ $\frac{3}{960}$, ſo the Fractions to bee reduced ſtand thus,

$\frac{37}{20}$ $\frac{3}{240}$ $\frac{3}{960}$.

And by the ſecond Example of the laſt Rule of this Chapter, the third, ſecond and fifth Rules of the ſame, will bee found $\frac{597}{320}$, as by the operation following is manifeſt.

1 Equal ciphers are firſt cut off by the third Rule,

2 The Numerator and Denominator abbreviated by the ſecond and fifth Rules.

3 By the firſt Rule the proof is made.

$\frac{37}{20}$ $\frac{3}{240}$ $\frac{3}{960}$.

Numerator of the firſt. 37 multiplied into 240 and 960, gives for a new Numerator for the firſt. 8524800

Numerator of the 2d. 3 multiplied into 20, and 960, gives for a new Numerator for the 2d. 57600

Numerator of the third 3 multiplied into 240 and 20, gives for a new Numerator for the third 14400

Which added together give for new Numerator 8596800

The Denominators multiplied continually give for a common Denominator 4608000

New

New Numerator	85968	00	42984	21492	10746	5373	1791	5
Com. Denominator	46080	00	23040	11520	5760	2880	960	3

320)59|7 by 320, &c.
32 (1*l.*

277
20

32)554|0 (17*s.*
32

234
224

100
12

32)120|0. 3*d.*
96

24
4

32) 96 (3 *q.* for proof.
96

12 *Two or more Fractions being given, whole numbers may bee found, which ſhall have the ſame reaſon or proportion as the Fractions given,* Viz. *If the Fractions have unequal Denominations, reduce them into Fractions equivalent, which ſhall have a common Denominatur (by the 11th. Rule of this Chapter) then rejecting the Common*

To finde whole numbers that ſhall have proportion one to another, as any given fractions have to themſelves.

Common Denominator, the Numerator ſhall have the ſame reaſon or proportion as the fractions firſt given. So $\frac{1}{3}$ and $\frac{3}{4}$ being given, will bee reduced, as in the 11th. Rule of this Chapter, to $\frac{4}{12}$ and $\frac{9}{12}$, then rejecting the Common Denominator 12, the Numerator 4 and 9 will have the ſame *Reaſon* with $\frac{1}{3}$ and $\frac{3}{4}$, *viz.* as $\frac{1}{3}$ is to $\frac{3}{4}$, ſo is 4 to 9 ($\frac{1}{3}$ of a ſhilling is 4*d.* and $\frac{3}{4}$ 9*d.*) and $\frac{3}{5}$ and $\frac{5}{8}$ after the like order will be reduced into $\frac{24}{40}$ and $\frac{25}{40}$, and the Numerators 24 and 25 have the ſame *Reaſon* with $\frac{3}{5}$ and $\frac{5}{8}$ ($\frac{3}{5}$ *l.* is 12 *s.* or 24 Teſters, $\frac{5}{8}$ is 12 *s.* 6 *d.* or 25 Teſters,) Alſo if the fractions $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{2}$ were given, there would bee found 8, 16, 32, which are in the ſame *Proportion* one to another, as the fractions given.

As $\frac{1}{8}$ to $\frac{1}{4}$, ſo 8 to 16.
As $\frac{1}{4}$ to $\frac{1}{2}$, ſo 16 to 32.
$\frac{1}{8}$ is the $\frac{1}{2}$ of $\frac{1}{4}$, and 8 the $\frac{1}{2}$ of 16.
$\frac{1}{4}$ is the $\frac{1}{2}$ of $\frac{1}{2}$, and 16 the $\frac{1}{2}$ of 32. Or,
16 contains 8 twice, as $\frac{1}{4}$ doth $\frac{1}{8}$, And
32 contains 16 twice, as $\frac{1}{2}$ doth $\frac{1}{4}$.

Vhen the Nu-
ierator and
Denominator
re equal, the
actions re-
reſents an U-
ite.

13 *When the Numerator and Dexominator are equal, the fraction is ſaid to bee an Unity, or* 1, viz. The Integer of $\frac{3}{4}$ is $\frac{4}{4}$, which repreſents an Unite, as 'tis a Fraction: So in $\frac{11}{12}$ the Integer or Unite of it is $\frac{12}{12}$, the Numerator of a proper fraction is leſs than an Unite, by ſo much as the Denominator is greater than the Numerator, for $\frac{15}{16}$ wants $\frac{1}{16}$ of an Unite, and the contrary both in leſs and greater numbers.

CHAP. 9.

Of Addition of Proper and Improper Fractions.

1

ALL Fractions proper or improper that are to be added together, muſt be of one Denomination, or by the former Rules bee reduced to one Denomination, viz.

Single fractions of equal Denominators added.

2 If the Terms given to be added are ſingle Fractions, and have a common Denominator, the ſumme of the Numerators added together is a new Numerator, and the Denominator in ſuch caſe is not altered: So $\frac{3}{8}$ and $\frac{2}{8}$ added together, will bee $\frac{5}{8}$: In like manner $\frac{7}{8}$ $\frac{5}{8}$ $\frac{3}{8}$ $\frac{2}{8}$ *l.* make $\frac{17}{8}$, which by the 8th. Rule of the 8th. Chapter will bee found equivalent unto 2 $\frac{1}{8}$.

An Illuſtration or Proof.

The Integer being a *l.* ſterling, $\frac{7}{8}$ is 17 *s.* 6 *d.* $\frac{5}{8}$ 12 *s.* 6 *d.* $\frac{3}{8}$ 7 *s.* 6 *d.* $\frac{2}{8}$ 5 *s.* in all 2 *l.* 2 *s.* 6 *d.* which is equivalent to 2 $\frac{1}{8}$, and is the ſumme of the fractions given to bee added.

Fractions of unequal Denominators added.

3 *If the Fractions given to bee added have not a Common Denominator, they are to bee reduced into Fractions of the ſame value, which ſhall have a Common Denominator (by the* 11*th. Rule of the* 8*th. Chapter.)* So $\frac{1}{4}$ $\frac{3}{5}$ $\frac{2}{15}$ $\frac{1}{60}$ *l.* be-

ing reduced, will bee $\frac{4500}{18000}$ $\frac{10800}{18000}$ $\frac{2400}{18000}$ $\frac{300}{18000}$ and added by the ſecond Rule of this Chapter, will bee found $\frac{18000}{18000}$, which repreſents an Integer, *viz.* $\frac{1}{4}$ is 5 *s.* $\frac{3}{5}$ is 12 *s.* $\frac{2}{15}$ is 2 *s.* 8 *d.* $\frac{1}{60}$ is 4 *d.* the ſumme of which fractions is 1 *l.*

ſingle fra-
on added to
compound
action.

4 *If any of the Fractions to bee added bee a compound Fraction, reduce it into a ſingle Fraction by the* 10*th. Rule of the* 8*th. Chapter, and proceed as before*:. So $\frac{3}{8}$ and $\frac{2}{3}$ of $\frac{1}{4}$ *l.* given to bee added, will bee found $\frac{13}{24}$, *viz.* $\frac{2}{3}$ of $\frac{1}{4}$ by the 10th. and ſecond Rules of the 8th. Chapter, will bee found $\frac{1}{6}$, then $\frac{3}{8}$ and $\frac{1}{6}$ by the 11th. and ſecond Rules of the ſame Chapter, will bee found $\frac{13}{24}$, and working after the ſame order $\frac{3}{5}$ and $\frac{2}{3}$ of $\frac{1}{4}$ will bee found $\frac{23}{30}$.

An Illuſtration or Proof of the firſt operation, the ſecond I omit to exerciſe the Learner.

$\frac{3}{8}$ is 7 *s.* 6 *d.* $\frac{2}{3}$ of $\frac{1}{4}$ *l.* ($\frac{1}{4}$ is 5 *s.*) is 3 *s.* 4 *d.* in all 10 *s.* 10 *d.* which is equivalent to $\frac{13}{24}$ *l.* for $\frac{1}{24}$ is 10 *d.* and 13 times 10 *d.* is 10 *s.* 10 *d.* But obſerve here, that in the former caſes in the 4 Rules aforegoing, the fractions given to bee added are fractions of Integers, which have one Denomination.

Mixt fractions
of different De-
nominations
added.

5 *To add Fractions of different Denominations, firſt reduce them into one Denomination by the* 10*th. Rule of the* 8*th. Chapter, and then add them by the ſecond or third Rule of this Chapter.*

$\frac{4}{5}$ *l.* $\frac{2}{3}$ *s.* and $\frac{3}{4}$ *d.* are given to bee added. $\frac{2}{3}$ *s.* is $\frac{2}{3}$ of $\frac{1}{20}$, which is $\frac{2}{60}$, or $\frac{1}{30}$. $\frac{3}{4}$ *d.* is $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{20}$, which is $\frac{3}{960}$ or $\frac{1}{320}$. $\frac{1}{30}$ and $\frac{1}{320}$ by the 11th. Rules of the 8th. Chapter, will bee found $\frac{350}{9600}$ by the ſecond and 5th. Rules of the 8th. Chapter $\frac{7}{192}$; Now $\frac{7}{192}$ and $\frac{4}{5}$ *l.* reduced by the 11th. Rule of the 8th. Chapter, or the 27th. Rule of the 5th. Chapter, will bee found 16 *s.* 8 *d.* 3 *q.* $\frac{4}{5}$ *l.* is 16 *s.* $\frac{2}{3}$ *s.* is 8. *d.* to which adde 3 *q.* and the ſummes are equal for proof.

See the third Example of the 11th. Rule of the 8th. Chapter.

6 If the mixt number given bee improper fractions, and have Denominators alike, add the Numerators together, and proceed as in Addition of ſingle fractions in the ſecond Rule of this Chapter; And $\frac{8}{4}$ and $\frac{12}{4}$ will bee found $\frac{20}{4}$, *viz.* $\frac{8}{4}$ is 2 Integers, and $\frac{12}{4}$ 3 Integers, which is 5 Integers, $\frac{8}{4}$ is 40 *s.* $\frac{12}{4}$ 60 *s.* both which added, make 5 *l.* or $\frac{8}{4}$ *s.* is 2 *s.* $\frac{12}{4}$ 3 *s.* both which make 5 *s.*

Addition of numbers mixt with Integers and Fractions together.

Example 1. Denominators alike.

If the mixt numbers given bee improper Fractions, and the Denominators unlike, as $\frac{10}{3}$ and $\frac{18}{4}$ *l.* reduce them by the 11th. Rule of the 8th. Chapter to $\frac{40}{12}$ and $\frac{54}{12}$, that is $\frac{94}{12}$, or $\frac{47}{6}$, which by the 8th. Rule of the 8th. Chapter is 7 $\frac{5}{6}$.

Example 2. Denominators unlike.

$\frac{10}{3}$ *l.* ($\frac{1}{3}$ being 6 *s.* 8 *d.*) 3 *l.* 6 *s.* 8 *d.* and $\frac{18}{4}$ ($\frac{1}{4}$ being 5 *s.*) is 4 *l.* 10 *s.* which added together, make 7 *l.* 16 *s.* 8 *d.* and is equivalent to 7 $\frac{5}{6}$ *l.*

Or when you have reduced them to $\frac{40}{12}$ and $\frac{54}{12}$, and found the improper fraction $\frac{40}{12}$ to bee 3 $\frac{1}{3}$ and $\frac{54}{12}$ to bee 4 $\frac{1}{2}$, you may add the

The whole numbers added together, and the fractions apart.

whole numbers together, ſaying, 4 and 3 is 7, then $\frac{1}{3}$ $\frac{1}{2}$ reduced to $\frac{2}{6}$ and $\frac{3}{6}$ (which is $\frac{5}{6}$) you finde the ſumme the ſame, or you may omit reducing $\frac{1}{3}$ and $\frac{1}{2}$, for $\frac{1}{3}$ is known to be 6 *s*, 8*d*. and $\frac{1}{2}$ 10 *s*. which is 16 *s*. 8 *d*. And after this laſt Order of working 3 $\frac{1}{2}$ 4 $\frac{1}{3}$ 16 $\frac{5}{8}$ firſt added together in their Integers, will bee found 23, then $\frac{1}{2}$ $\frac{1}{3}$ $\frac{5}{8}$ will bee found 1 $\frac{11}{24}$, ſo 24 $\frac{11}{24}$ is the ſumme of the mixt numbers given to be added.

3 $\frac{1}{2}$ *l*. is 3 *l*. 10. *s*. 4 $\frac{1}{3}$ is 4 *l*. 6 *s*. 8 *d*. 16 $\frac{5}{8}$ is 16*l*. 12 *s*. 6 *d*. which added, is 24 *l*. 9 *s*. 2 *d*. and is equivalent to 24 $\frac{11}{24}$ *l*.

CHAP. 10.

Of Subſtraction of Fractions Proper and Improper.

Single fractions with like Denominators.

1

IF the Fractions given have a common Denominator, ſubſcribe the Denominator under the Remains, when the leſſer Numerator is ſubſtracted from the greater, and that fraction will bee the difference ſought: So the difference between $\frac{7}{8}$ *l*. and $\frac{2}{8}$, is $\frac{5}{8}$ *l*. *viz*. $\frac{7}{8}$ *l*. is 17 *s*. 6 *d*, from whence take $\frac{2}{8}$ (which is $\frac{1}{4}$ or 5 *s*. there reſts $\frac{5}{8}$, which is 12 *s*. 6 *d*.

Single fractions with unlike Denominators.

2 *If the Fractions given have not a common Denominator, reduce them by the 11th. Rule of the 8th. Chapter, and the difference will bee diſcovered by the laſt Rule*: So the difference between $\frac{5}{6}$ and $\frac{7}{8}$ *l*. will bee found $\frac{1}{24}$ *l*. The

Fractions reduced are $\frac{40}{48}$ and $\frac{42}{48}$, the difference is $\frac{2}{48}$ or $\frac{1}{24}$, *viz.* $\frac{5}{6}$ *l.* is 16 *s.* 8 *d.* $\frac{7}{8}$ 17 *s.* 6 *d.* then 16 *s.* 8 *d.* from 17 *s.* 6 *d.* reſts 10 *d.* which is equal to $\frac{1}{24}$, and is the difference ſought.

A whole number from a mixt.

3 *Subſtract the whole number from the whole part of the mixt number, and annex the fractional part of the mixt number given, unto the Remainder*; So 9 ſubſtracted from 22, and $\frac{5}{8}$, the difference will bee 13 and $\frac{5}{8}$.

A mixt number from a whole.

4 *Subſtract the fractional part of the mixt number from an Integer, or* 1 *borrowed from the whole number given, and ſet down the fraction remaining, then unto the Integer of the mixt number add the Integer borrowed, and ſubſtract the ſame from the whole number given, and the laſt Remains added to the former, gives the difference ſought*: So 7 and $\frac{5}{7}$ ſubſtracted from 40, leaves 32, and $\frac{2}{7}$, *viz.* from an Integer, or 1 (which is $\frac{7}{7}$) borrowed from 40, I take $\frac{5}{7}$, the Numerator 5 from the Numerator 7, and there reſts $\frac{2}{7}$, the firſt Remainder, then unto 7 the Integer of the mixt number, I add the Integer borrowed from 40, which makes 8, and 8 from 40 reſts 32 the ſecond Remainder, which with $\frac{2}{7}$ the firſt Remainder, gives 32 $\frac{2}{7}$ the difference ſought.

A fraction from an Integer.

5 *Subſtract the Numerator from the Denominator, and ſet the Remains over the Denominator*: So $\frac{3}{8}$ ſubſtracted from an Integer, or 1 (that is $\frac{8}{8}$) the difference ſought will bee $\frac{5}{8}$ and $\frac{12}{20}$, or $\frac{3}{5}$ ſubſtracted from 1 ($\frac{20}{20}$) the difference will bee $\frac{8}{20}$, or $\frac{2}{5}$.

6 The

A fraction from a whole number.

6 *The Fraction ſubſtracted from one of the Integers given, and the Remainder annexed to the number of Integers leſſened by an Unity, or 1, gives the difference ſought:* So $\frac{3}{8}$ ſubſtracted from 16, leaves 15 $\frac{5}{8}$, and $\frac{5}{8}$ ſubſtracted from 16 leaves 15 and $\frac{3}{8}$.

A fraction from a mixt number. The fraction leſs than the fractional part of the mixt number.

7 *If the Fraction given bee leſs than the fractional part of the mixt number, the leſſer Fraction ſubſtracted from the greater, and the Remains annexed to the whole part of the mixt number, gives the difference ſought:* So $\frac{3}{9}$ ſubſtracted from 13 $\frac{5}{8}$ leaves 13 $\frac{21}{72}$, or $\frac{7}{24}$ for the difference ſought.

Two fractions being given, to diſcern which is the greateſt.

To finde which of the two Fractions given is the greateſt, ſee the ſecond Rule of this Chapter, where you finde $\frac{5}{6}$ and $\frac{7}{8}$ by the 11th. Rule of the 8th. Chapter reduced to $\frac{40}{48}$ and $\frac{42}{48}$, $\frac{40}{48}$ is equivalent to $\frac{5}{6}$, and $\frac{42}{48}$ to $\frac{7}{8}$, whence it appears that $\frac{7}{8}$ is greater than $\frac{5}{6}$, becauſe 42 the Numerator of the laſt fraction is greater by $\frac{2}{48}$ or $\frac{1}{24}$, than the firſt: So in the laſt Example $\frac{3}{9}$ and $\frac{5}{8}$ reduced, will bee $\frac{24}{72}$ and $\frac{45}{72}$, which ſhews $\frac{5}{8}$ to bee greater than $\frac{3}{9}$ by $\frac{21}{72}$, or $\frac{7}{24}$, but when you come to bee converſant with the Tables of Practice, you may diſcover the greater of any two fractions at firſt ſight.

A fraction from a mixt number. The fraction greater than the fractional part of the mixt numbers.

8 *If the Fractions given bee greater than the fractional part of the mixt number, ſubſtract the greater Fraction from an Integer borrowed from the mixt number, and unto the fractional part of the mixt number, add the Remains, then the Fraction found by that Addition annexed to the whole part of the mixt number leſſened by an*

Integer gives the difference: So $\frac{7}{9}$ ſubſtracted from 11 $\frac{1}{8}$, leaves 10 $\frac{81}{72}$, which being annexed to 10 (the whole number of Integers leſſened by an Unite or 1) gives 10 $\frac{61}{72}$, the difference ſought.

9 *Subſtract the leſſer fraction from the greater, and the Integers of the leſſer mixt number from the Integers of the greater, and both the Remainders will bee the difference ſought*: So 15 $\frac{3}{9}$ ſubſtracted from 18 $\frac{4}{5}$, the difference will bee 3 $\frac{21}{45}$, or $\frac{7}{15}$, *viz.* $\frac{3}{9}$ from $\frac{4}{5}$ leaves $\frac{21}{45}$ or $\frac{7}{15}$, then 15 the Integers of the leſſer mixt numbers ſubſtracted from 18 the Integers of the greater, leaves 3, which ſet before $\frac{7}{15}$ the firſt Remainder, ſhews 3 $\frac{7}{15}$ the Remainder or difference ſought.

One mixt number from another, the fractional part of that to bee ſubſtracted leſs than the fractional part of that out of which it is to bee ſubſtracted.

10 Subſtract the greater Fraction from an Integer borrowed from the greateſt mixt number, and the remains reſerve as the fractional part of the difference ſought; Then unto the Integers of the leſſer mixt number, add the Integers borrowed, and ſubſtract the ſumme from the Integers of the greater mixt number, and that which laſt remains, together with the Fraction reſerved, is the difference ſought: So 18 $\frac{5}{8}$ ſubſtracted from 27 $\frac{3}{7}$, the Remainder or Difference will bee 8 $\frac{45}{56}$, *viz.* $\frac{5}{8}$ from an Integer, or 1, reſts $\frac{3}{8}$, which added to $\frac{3}{7}$, gives $\frac{45}{56}$, then adding the Integer borrowed unto 18, it will bee 19, that ſubſtracted from 27, leaves 8, which with the fraction reſerved, ſhews the Remainder or Difference ſought to bee 8 $\frac{45}{56}$.

One mixt number from another, the fractional part of that to bee ſubſtracted greater than the fractional part of that out of which it is to be ſubſtracted.

Although the Order I have obſerved in this Chapter bee in my apprehenſion both expeditious and advantagious to the Learner, (if hee pleaſe) hee may have recourſe to the following general Rule, *viz.*

11 *When one of the Terms given is a whole or mixt Number, alſo when both of them are mixt, reduce ſuch whole or mixt numbers into an improper Fraction or Fractions, and the operation will bee according to the firſt and ſecond Rule of this Chapter.*

A Trial of the laſt Queſtion by this General Rule.

18 $\frac{5}{8}$ from 27 $\frac{3}{7}$, Theſe mixt numbers by the 7th. Rule of the 8th. Chapter, will bee reduced into $\frac{149}{8}$ and $\frac{192}{7}$, and by the 11th. Rule of the ſame Chapter into $\frac{1536}{56}$ and $\frac{1043}{56}$, then by the firſt Rule of this Chapter 1043 ſubſtracted from 1536, leaves $\frac{493}{56}$, which reduced by the 8th. Rule, of the 8th. Chapter, gives 8 $\frac{45}{56}$, the Remainder or Difference ſought, but by the order of the work it is apparent, that the former Method is more conciſe.

$$\begin{array}{ccccll}
18\frac{5}{8}\ \text{from} & 27\frac{3}{7} & \frac{192}{8} & \frac{149}{7} & \frac{8}{7} & \\
\overline{149} & \overline{192} & \overline{1536} & \overline{1043} & \overline{56} & \text{common} \\
\overline{8} & \overline{7} & \underline{1043} & \text{ſubſtracted.} & & \text{Denom.} \\
 & & 493 & & 56)\,493\,(8\frac{45}{56}. & \\
 & & \overline{56} & & \underline{448} & \\
 & & & & 45 &
\end{array}$$

CHAP,

CHAP. 11.

Of Multiplication of Fractions Proper and Improper.

1

IF the Terms given bee ſingle Fractions, the Numerators multiplied continually conſtitute a new Numerator, and the Denominators ſo multiplied produce a new Denominator: So the Product of $\frac{3}{4}$ multiplied by $\frac{4}{5}$ is $\frac{12}{20}$, or $\frac{3}{5}$; Here it is evident, that $\frac{3}{4}$ *l.* which is 15 *s.* multiplied by $\frac{4}{5}$, which is 16 *s.* produceth but $\frac{3}{5}$, or 12 *s.* Whence it is to bee underſtood, that although the Product in whole numbers is greater than the two terms from whence it proceeds, yet in fractions it is leſs: for as whole numbers being greater than one, are ſtill made more; ſo ſingle fractions being leſs than one, are ſtill made leſs; yet as well in fractions as in whole numbers, the Product bears the ſame proportion to the Multiplicand, as the Multiplier doth to an Unite, *viz.* $\frac{3}{5}$ the Product bears the ſame proportion to $\frac{3}{4}$ the Multiplicand, as $\frac{4}{5}$ the Multiplier doth to an Unite.

An Illuſtration or Proof.

Admit the Integer a pound ſterling 240 pence $\frac{3}{5}$ of 240 is 144, $\frac{3}{4}$ is 180, and $\frac{4}{5}$ 192, then as 144 to 180, ſo 192 to 240, for 144 is $\frac{4}{5}$ of 180, and 192 is $\frac{4}{5}$ of 240.

Or thus,

$\frac{3}{5}$ is 12 *s.* $\frac{3}{4}$ 15 *s.* $\frac{4}{5}$ 16 *s.* $\frac{5}{5}$ 20 *s.*
As 12 *s.* to 15 *s.* ſo 16 *s.* to 20 *s.*

$$\left.\begin{array}{l}\text{3 is contained in 12, 4 times}\\ \text{3 is contained in 15, 5 times}\end{array}\right\}\ \frac{4}{5}$$

$$\left.\begin{array}{l}\text{4 is contained in 16, 4 times}\\ \text{4 is contained in 20, 5 times}\end{array}\right\}\ \frac{4}{5}$$

If you multiply $\frac{4}{5}$ by $\frac{3}{4}$, then, as 144 to 192, ſo 180 to 240, 144 is $\frac{3}{4}$ of 192; and 180 is $\frac{3}{4}$ of 240.

Obſervation.

$\frac{3}{4}$ or $\frac{4}{5}$ of 240, or any other whole number, is found by multiplying the whole number by the Numerator of the Fraction, and dividing the Product by the Denominator, ſo $\frac{4}{5}$ of 240 is 192, or you may have recourſe to the third Rule by which ſuch like Queſtions may bee reſolved.

4/5

240
4
——
5|960
——
192

Divers proper fractions multiplied into one product.

2 *Reduſe them by the 11th. Rule of the 8th. Chapter, and by the firſt Rule of the 9th. Chapter add the Fractions for Multiplicand into one Summe, and the Fractions for Multiplier into another, then multiply as in the firſt Rule, and the work is done:* So $\frac{3}{10}$ and $\frac{2}{5}$ multiplied by $\frac{3}{5}$ and $\frac{2}{7}$, the product will bee $\frac{217}{350}$, for $\frac{3}{10}$

and $\frac{2}{5}$ reduced and added, will bee $\frac{28}{40}$, or $\frac{7}{10}$ and $\frac{3}{5}$, and $\frac{2}{7}$ will bee $\frac{31}{35}$, then $\frac{7}{10}$ and $\frac{31}{35}$ multiplied as before, produce $\frac{217}{350}$.

Mixt numbers multiplied.

3 *If one of the Terms given bee a whole or a mixt number, or if both of them are mixt numbers, reduce ſuch whole or mixt numbers into an improper Fraction or Fractions by the* 7, 8, *or 9th.* Rules *of the* 8*th.* Chapter, *and the operation will bee the ſame as in the laſt* Rule. So 9 $\frac{3}{7}$ multiplied by 8, the product will bee 75 $\frac{3}{7}$, for 9 $\frac{3}{7}$ reduced into an improper fraction, will bee $\frac{66}{7}$, alſo 8 will bee $\frac{8}{1}$, then multiplying 66 by 8, the product is 528 for a new Numerator, likewiſe multiplying 7 by 1, the Product is 7 for a new Denominator, which new fraction $\frac{528}{7}$ reduced, will bee 75 $\frac{3}{7}$ the Product ſought. In like manner 7 $\frac{3}{8}$ multiplied by 5 $\frac{3}{5}$ the product ſought will bee 41 $\frac{3}{10}$ and 7 $\frac{5}{8}$ multiplied by 5 $\frac{3}{5}$ will produce 42 7

Compound broken numbers, or fractions of fractions multiplied.

4 Reduce the Terms given by the 10 and 11 Rules of the 8th. Chapter, and proceed as before, *viz.* 5 *l.* 19 *s.* 3 *d.* is given to bee multiplied by 4 *l.* 18 *s.* 3 *d.* By the 10th. Rule of the 8th. Chapter 5 *l.* 19 *s.* 3 *d.* will bee reduced to $\frac{119}{20}$ and $\frac{3}{240}$, and afterwards by the 11th. Rule, firſt to $\frac{28560}{4800}$ and $\frac{100}{4800}$, and next to $\frac{28660}{4800}$ for Multiplicand. After the ſame order 4 *l.* 18 *s.* 3 *d.* will bee reduced to $\frac{23580}{4800}$ for Multiplier, then by the former Rules in this Chapter, and the 2, 3, and 4th. Rules of the 8th. Chapter, the Product will bee $\frac{187723}{6400}$, and by the firſt Rule of the 8th. Chapter 29 *l.* 6 *s.* 7 *d.* 2 *q.* $\frac{19}{20}$.

Queſtions of this nature are ſeldome either uſeful or beneficial, and therefore moſt commonly wrought rather for delight than neceſſity. Upon which conſideration I had waved this Queſtion, but that the perſon who late propoſed the ſame to a Boy, might hereby rectifie his ignorance, and underſtand to anſwer his own Propoſition.

A Modern Author in the 152 page of his Book, propounds 5 *l.* 5 *s.* 5 *d.* to bee multiplied by the ſame numbers, and gives the Product to bee 27 *l.* 15 *s.* 7 *d.* &c. and proves the Operation by Reduction. Notwithſtanding which, a late writer in the 39 page of his Book modeſtly rebukes him, and detects his Rule (for the ſolution of Queſtions of ſuch nature) to bee erronious; yet runs from the *Queſtion* the Author propounded, whereas the Propoſition being truly anſwered, 'tis very poſſible the Rule may bee falſe printed, and ſo conſequently it may be concluded, that the Author had been more juſtly quarrelled, had hee been confuted in his own *Queſtion*; for though I confeſs the Authors Method is not ſo genuine and clear as the late Writers, yet the order of the following work will prove

5 *l.*—5 *s.*—5 *d.* multiplied by
5 5 5 to be 27 *l.* 15 *s.* 7 *d.* &c.
According to the Authors Anſwer.

l. — *s.* — *d.*
5 — 5 — 5   5*d.* is $\frac{5}{12}$ of $\frac{1}{20}$, *viz.* $\frac{5}{240}$
20

$\frac{105}{20}$ $\frac{5}{240}$

$$\begin{array}{r} 105 \\ 24 \\ \hline 420 \\ 210 \\ \hline 25200 \\ 100 \\ \hline \end{array} \qquad \begin{array}{r} 20 \\ 5 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 240 \\ 20 \\ \hline 4800 \end{array}$$

New Numerator —253|00
New Denominator—48|00

Equal Ciphers cut off, the Terms to bee multiplied stand thus,

$$\frac{253}{48} \qquad \frac{253}{48} \qquad \begin{array}{r} 253 \\ 253 \\ \hline 759 \\ 1265 \\ 506 \\ \hline 64009 \end{array}$$

$$\begin{array}{r} 48 \\ 48 \\ \hline 384 \\ 192 \\ \hline 2304 \end{array}$$

Com. Denom.   Com. Numer.

5*l.* 5*s.* 5*d.* 3*q* multiplied by the same numbers, produce
27*l.* 16*s.* 3*d.* 2*q.* $\frac{185}{378}$
2304)

Or thus;

```
2304)64009 (27 l. 1801/2304
     4608
     ----
     17929
     16128
     -----
      1801
        20
2304 ) 36020 (15 s. 1460/2304
       2304
       ----
       12980
       11520
       -----
        1460
          12
       -----
2304 )17520 (7 d. 1392/2304
      16128
      -----
       1392
          4
       ----
2304 ) 5568 (2 q. 5/12
       4608
       ----
        960
```

Com. Numer.	960	480	240	120	60	30	15	5
Com. Denom.	2304	1152	576	288	144	72	36	12

CHAP.

CHAP. 12.

Of Diviſion of Proper and Improper Fractions.

When whole or broken numbers, either proper, mixt, or compounded, are to bee divided, reduce both Dividend and Diviſor to a ſingle Fraction, place the Diviſor on the left hand, the Dividend toward the right, then multiply the Denominator of the Diviſor by the Numerator of the Dividend, and the product will bee a new Numerator; Alſo multiply the Denominator of the Dividend by the Numerator of the Diviſor, and the product will bee a new Denominator unto the Fractions given, and ſuch new Fraction is the Quotient ſought; So if $\frac{5}{8}$ bee given to bee divided by $\frac{1}{8}$, the Quotient will bee 5, for 8 the Denominator of the Diviſor multiplied into 5 the Numerator of the Dividend quotes 40 for a new Numerator, and 8 the Denominator of the Dividend multiplied into 1 the Numerator of the Diviſor, gives 8 for a new Denominator, which by the 8th. Rule of the 8th. Chapter is 5: Whence obſerve, that Diviſion of Fractions is directly contrary to that of whole numbers, for in whole numbers the Quotient is ever leſs than the Dividend, but in Fractions greater than the Terms given.

$$\frac{1}{8} \times \frac{5}{8} \left(\frac{40}{8}\right) 5$$

Example 1. Single fractions divided.

1 As the Diviſor of the Fraction propounded is in proportion to the Dividend, ſo will an Unite bee unto the Quotient, Or

2 As the Diviſor is to an Unite or 1, ſo is the Dividend to the Quotient.

1 As $\frac{1}{8}$ the Diviſor is contained 5 times in $\frac{5}{8}$ the Dividend, ſo is an Unite or 1 contained 5 times in 5 the Quotient.

Or,

2 As $\frac{1}{8}$ the Diviſor is to 1, ſo is $\frac{5}{8}$ the Dividend to 5 the Quotient.

A farther Illuſtration.

Admit the Unite to bee a pound ſterling, in which are 240 *d.* $\frac{5}{8}$ or 12 *s.* 6 *d.* the Dividend, is 150 *d.* 2 *s.* 6 *d.* the Diviſor 30 *d.* the Unite 240 *d.* 5 the Quotient (which is 5 times 240) 1200 *d.*

Then firſt, As 30 the Diviſor to 150 the Dividend, ſo 240 to 1200, 150 the Dividend contains 30 the Diviſor 5 times, and 1200 contains 240, 5 times. Or,

Secondly, As 30 the Diviſor to 240 the Unite, ſo 150 the Dividend to 1200 the *Quotient*, 30 the Diviſor is contained 8 times in 240 the Unite, and 150 the Dividend as many times in 1200 the *Quotient.*

Example 2. Divers fractions divided by a ſingle fraction.

If $\frac{7}{11}$ and $\frac{3}{7}$ bee divided by $\frac{1}{4}$, the *Quotient* will bee $\frac{28}{11}$, for 4 the Denominator of the Diviſor multiplied into 7 the Numerator of the Dividend, quotes 28 for a new Numerator, and 5 the Denominator of the Dividend multiplied into 3 the Numerator of the Diviſor, quotes 15 for a new Denominator.

$\frac{3}{4}$ $\frac{7}{5}$ $\frac{28}{15}$

$\frac{3}{7}$ and $\frac{7}{12}$ divided by $\frac{1}{2}$ will produce $\frac{4}{2}$ or 2, $\frac{3}{7}$ and $\frac{7}{12}$ reduced, will bee $\frac{21}{84}$ or $\frac{1}{4}$, then $\frac{1}{2}$ divided by $\frac{1}{4}$, will quote $\frac{4}{2}$, or 2, as in the Margent.

$\frac{1}{4}$ $\frac{1}{2}$ $\frac{4}{2}$

Example 3. A whole number divided by a fraction.

If 12 bee divided by $\frac{2}{3}$ and $\frac{3}{4}$, the *Quotient* will bee 24, *viz.* $\frac{2}{3}$ and $\frac{3}{4}$ reduced, are $\frac{1}{2}$, as before, then 12 by the 9th. Rule of the 8th. Chapter will bee $\frac{12}{1}$, an improper Fraction, and proceeding as before, the *Quotient* will bee found 24, by which you may underſtand, that if 12 *d.* were to bee divided by 1, the *Quotient* would bee 12 *d*, but the Fraction being but $\frac{1}{2}$ *d.* it is contained 24 times in a ſhilling.

$\frac{1}{2}$ $\frac{12}{1}$ | 24

Example 4. A whole or a mixt number divided by a whole or mixt number, &c.

If 38 bee given to bee divided by 4 $\frac{1}{2}$, the Fraction reduced and divided, will quote $\frac{76}{9}$, as in the Margent, *ſo 29 $\frac{1}{4}$ divided by 47, quotes $\frac{117}{188}$.

$\frac{9}{2}$ $\frac{38}{1}$ | $\frac{76}{9}$

* See the 9th. queſtion in the 6th. chap.

Any part or parts of a number given to finde the integer.

Admit 192 were a number given, which is $\frac{4}{5}$ parts of a number required: *In all ſuch caſes divide the Number given by the Fraction, and the Quotient will bee the number required:* So 192 divided by $\frac{4}{5}$ will bee 240.

See the obſervation at the foot of the firſt Rule in the 11th. chapter.

$\frac{4}{5}$ $\frac{192}{1}$ | $\frac{960}{4}$ | $\frac{240}{1}$.

CHAP. 13.

Reduction of divers Coins.

Reduction of divers Coines.

ALthough moſt Queſtions of like nature with thoſe in this Chapter may bee more artificially anſwered by the Practical or Golden Rules, yet I think it fit to obſerve the following Order, becauſe it is agreeable to the Methods of the beſt Schools, and gives the Learner the advantage of underſtanding different operations, and ſo will conſequently qualifie him with abilities to make choice of the beſt.

¶ *In Queſtions of Coins the numbers ſought are diſcovered by reducing, multiplying, and dividing the numbers given, according to the following Order.*

Queſtion 1.

Georges
In 5601 at 2s. 6d. how many Dollers
30 12 at 4 s. 2 d.
12
50 | 168030 | 0 30 d.
50 d.
Anſwer 3360 $\frac{3}{5}$ Dollers
30 30 | 168030
168030 5601

Here it is apparent, that 4 *s.* 2 *d.* is reduced to 50 *d.* 2 *s.* 6 *d.* to 30 *d.* and 5601

Georges multiplied thereby, and the product divided by 50, which quotes 3360 $\frac{3}{5}$ Dollers. The Dollers are afterwards multiplied by 50, to prove one part of the work, and the product of the firſt number multiplied by 30, divided again by the ſame to prove the ſecond part, but you may uſe or omit the proofs at pleaſure.

Obſervation

But obſerve, that in this and all other Queſtions of like nature, that when the ſecond and third Numbers are reduced to one Denomination, the ſecond is multiplied into the firſt, and the product divided by the third.

Queſt. 2.

Royals.

In 5702 at 6 *d.* $\frac{1}{2}$ how many Stivers

26 4 at 4 *d.* $\frac{1}{4}$

~~11404~~ 4

34212 26 farthings

11404 17 farthings

17|148252

Anſwer– 8720 $\frac{12}{17}$ Stivers. Or thus;

17)148252(8720 $\frac{12}{17}$

136

122

119

35

34

12

Queſt. 3.

Scivers

In 5601 at 4d. $\frac{1}{4}$ how many marks at 13s. 4d.

17 4 12

39207 17 farthings 160

5601 4

64|9521|7 (148 $\frac{497}{640}$ Marks. 640 q.

64

312

256

561

512

49

Queſt. 4.

Cardecues

In 5789 at 18 $\frac{1}{2}$ d. how many Scotch peeces at 13 d. $\frac{1}{2}$

37 2 2

40523 37 half-pence 27 ob.

17367

27|214193 (7933 $\frac{2}{27}$ Scotch peeces

189

251

243

89

81

83

81

2

Queſt. 5.

l. Scottiſh

In 4061 at 20*d.* how many *l.* ſterl. at 20 *s.*

20 12

24|8122|0 (338 *l.* $\frac{100}{240}|\frac{10}{24}|\frac{5}{12}|$ ſterl. 240 *d.*

72

92

72

202

192

10

Queſt. 6.

French Crowns

In 5608 at 6*s.* how many Jacobuſſes at 22*s.*?

6

22|33648 (1529 $\frac{10}{22}|\frac{5}{11}$ Jacobuſſes

22

116

110

64

44

208

198

10

Quest. 7.

Dollers
In 9060 at 5 s 8 5/6 d how many l. at 20 s?

[illegible] 413 12 12

2718 68 5/6 240

906 6

3624 413 1440

144|3741780 (25984 84/144|42/72|21/36|7/12 sterling money

288

861

720

1417

1296

1218

1152

660

576

84

Queſt. 8.

Duckets.

In 980 at 5 *s.* 9 *d.* ¾ how many *l.* at 20 *s.*

```
     12                    12
  ------                 ------
    69¾                    240
  ------                     9
    628                  ------
     98                   2160
  ------
   5024
   5652
  ------
216|61544(284 l. 200/216|100/108|50/54|25/27|
    432
  ------
   1834
   1728
  ------
   1064
    864
  ------
    200
```

In both the laſt Queſtions, when 20 s. is reduced into 240 pence, the pence are multiplied by the Denominator of the Fraction, to bee brought into the ſame Denomination with the ſecond Numbers.

Reduction of Lead.

C. qu. lb.
In 99—3—28 of Lead, how many Fother at 19 ½ C,
2 2
39)199(5 Fother 2 C. 1 qu. 18 lb. 39
195
4

In 200 Piggs of Lead, each 4 ½ C, how many Fother at 19 C. ½.
9 2 2
39) 1800 (46 Fother 3 C. 9 39
156
240
234
6

CHAP. 14.

Of Rules of Practice, or Compendious Operations in the Rule of Three.

1 Table.

1 Table.

The Aliquots part of a pound, in ſhillings, pence, and farthings.

s	*d*	*f*	*parts*
0	0	1	$\frac{1}{960}$
0	0	2	$\frac{1}{480}$
0	0	3	$\frac{1}{320}$
0	1	0	$\frac{1}{240}$
0	1	2	$\frac{1}{160}$
0	2	0	$\frac{1}{120}$
0	3	0	$\frac{1}{80}$
0	4	0	$\frac{1}{60}$
0	5	0	$\frac{1}{48}$
0	6	0	$\frac{1}{40}$
0	8	0	$\frac{1}{30}$
0	10	0	$\frac{1}{24}$
1	0	0	$\frac{1}{20}$
1	3	0	$\frac{1}{16}$
1	4	0	$\frac{1}{15}$
1	8	0	$\frac{1}{12}$
2	0	0	$\frac{1}{10}$
2	6	0	$\frac{1}{8}$
3	4	0	$\frac{1}{6}$
4	0	0	$\frac{1}{5}$
5	0	0	$\frac{1}{4}$
6	8	0	$\frac{1}{3}$
10	0	0	$\frac{1}{2}$

2 Table.

The aliquot parts of a ſhilling, in pence and farthings.

d	*f*	*parts*
0	1	$\frac{1}{48}$
0	2	$\frac{1}{24}$
0	3	$\frac{1}{16}$
1	0	$\frac{1}{12}$
1	2	$\frac{1}{8}$
2	0	$\frac{1}{6}$
3	0	$\frac{1}{4}$
4	0	$\frac{1}{3}$
6	0	$\frac{1}{2}$

By the firſt Table you finde
1 farthing to bee $\frac{1}{960}$ *l.*
2 farthings to be $\frac{1}{480}$
3 farthings $\frac{1}{320}$
1 penny $\frac{1}{240}$, &c.

By the ſecond
1 farthing to bee $\frac{1}{48}$ *s.* 20)240(1
40
2 farthings $\frac{1}{24}$
3 farthings $\frac{1}{16}$
1 penny $\frac{1}{12}$
1 $\frac{1}{2}$ penny $\frac{1}{8}$, &c. which are to bee perfectly learned by heart, before any profitable progreſs can bee made in the Rules following.

The Learner by imprinting the former Tables in memory, will be able readily to reſolve any Queſtion propounded, by dividing the numbers given by one or more aliquot parts of 20 *s.* or 12 *d. viz.*

Rule 1. *If the price of the Commodity bought bee but one aliquot part of 20 s. divide the ſumme given by the price, and the Quotient anſwers the Queſtion:* So 7968 Yards, Ells, Pounds, or the like, each 4 *s.* divided by 5, the price being $\frac{1}{5}$ *l.* will be found 1593 *l.* 12 *s.* and 7968 *lb.* at 5 *s.* divided by 4, being $\frac{1}{4}$, will be 1992 *l, viz.*

---

1 At 4 *s. per lb.* what 5|7968 *lb.* weight.

Anſwer 1593 *l.* 12 *s.* ſterling.

2 At 5 *s. per lb.* what 4|7968 *lb.*

Anſwer 1992 *l.*

3 At 3 *s.* 4 *d.* what 6|7896 *lb.*

Anſwer 1316 *l.*

4 At 2 *s.* 6 *d.* what 8|7968 *lb.*

Anſwer 996 *l.*

Rule 2. *When the price conſiſteth of a certain number of ſhillings that are not an aliquot part,* *you may multiply the ſumme given by any ſuch number of ſhillings, and divide the product by* 20, *or you may part it into* 2, *or more aliquot parts,* viz.

1 At 9 *s.* what $\frac{1}{4}$ $\frac{1}{5}$|7898 Ells.

1974—10
1579—12

Anſwer 3554—2—0

2 At 14 *s.* what $\frac{1}{2}$ $\frac{1}{5}$|7898 Ells.

3949
1579—12

Anſwer 5528—12—0

7898 multiplied by 9, and the product divided by 20, gives the ſame Anſwer.

7898
9
20|71082
11
10
08 3554
0

3 At 4*s.* 4*d.* what $\frac{1}{5}$ $\frac{1}{12}$|7978 C. weight.

1595—12
132—19—4

Anſwer 1728—11—4

4 At

|2|

4 At 14*s*. 6*d*. what |$\frac{1}{2}$ |78978 *lb.*

39489

15795—12 *s.*

1974—07—6 *d.*

Anſwer 57258—19—6

In the firſt of the two laſt Examples (the third Queſtion) for 4 *s.* I take $\frac{1}{5}$ of 7978 the ſumme given, then for 4 *d.* $\frac{1}{12}$ of that, becauſe 12 groats make 4 *s.*

In the ſecond (the 4th. Queſtion) for 10 *s.* I take $\frac{1}{2}$. for 4 *s.* $\frac{1}{5}$, then $\frac{1}{8}$ of that for 6 *d.* becauſe 8 Teſters make 4 *s.* and after the ſame order any ſumme given may bee diſtributed into two or more aliquot parts of 20*s.* or 12*d.* or 112 *lb.* &c. as will bee manifeſt by the following Operations.

See the obſervation at the foot of the 6th. Queſtion in the 6 Chapter.

Examples where the price is an aliquot part of a ſhilling or 12 pence.

---

1 At 1 *d. per lb.* what 12|7864 *lb.*

2|65|5—4 *d.*

Anſwer 32—15—4

2 At 2 *d.* what 6|7864 *lb.*

2|131|0—8 *d.*

Anſwer 65—10—8

3 At 3*d* *per lb.* what 4|7864 *lb.*

2|196|6

Anſwer 98—6

4 At 4 *d.* what 3|7864 *lb.*

2|262|1—4

Anſwer 131—1—4.

The prices in the four laſt Examples being Aliquot parts of 20 *s.* as well as 12 *d.* the ſeveral Anſwers might have been given in pounds at one operation, for the firſt ſumme given divided by 240, the ſecond by 120, the third by 80, and the fourth by 60, the ſeveral *Quotients* would have been *l.* at firſt Operation.

Examples where the price is not an Aliquot part of 12 d.

1 At 5 *d. per* yard what 3|9876 yards.

4|3292
823

2|411|5

Answer 205—15.

2 At 7 *d. per* yard what ½|9876 yards

4938
823

2|576|1

Answer 288—1—0

3 At 9 *d. per* yard what ½|7896

3948
1974

2|592|2

Answer 296—2—0

|4|
4 At 11 d. what |3|7896 yards
|3|

1974
2632
2632

2|723|8

Anſwer 361 - 18 - 0

In the firſt, for 4 d. the given ſumme is divided by 3, then for the 1 d. I take $\frac{1}{4}$ of that quotient. In the ſecond, for 6 d. I take $\frac{1}{2}$, then for 1 d. $\frac{1}{6}$ of that. In the third, for 6 d. I take $\frac{1}{2}$, then for 3 d. $\frac{1}{2}$ of that; but in the fourth, the beſt way is to divide by 4, 3, and 3, becauſe having once taken $\frac{1}{3}$, it is in the next place but only ſetting down the ſame number again, and in ſuch caſes the Learner is to exerciſe his care and diſcretion in breaking the prices into ſuch Aliquot parts as may bee moſt pertinent to his purpoſe. Obſervation

The four laſt Examples might have been performed in parting the prices into the Aliquot parts of 20 s. *viz.* In the firſt Example the price might have been parted into 4 and 1 as before, then for 4 d. the ſum given divided by 60, and for 1 d. that quotient divided by 4. The ſumme given in the ſecond Example by 40, and that quotient by 6. The third Obſervation by 30, and that quotient by 8, &c. The following Example will illuſtrate what hath been ſaid more ſignificantly.

At 10 *d. per* yard what $\frac{2}{3}$|7896 yards.

3948
2632

2|658|0

Anſwer 329 *l.*

At 10 *d.* what |$\frac{30}{4}$|789|6

263 — 4
65 — 16

Anſwer 329 — 0

7896 divided by 30 for 8 *d.* quotes 263 *l.* the $\frac{6}{30}$, or $\frac{1}{5}$ remaining, being 6 times 2 groats, (or 2 times 6 groats) is 4 *s.* then 263 *l.* 4 *s.* divided by 4, for the other 2 *d.* gives 65 *l.* and there remains 3 *l.* which turned into ſhillings, and added to the 4 *s.* in the rank of ſhillings, gives 64, and divided by 4 quotes 16 *s.* and this is alwaies to bee obſerved, if you divide the ſumme given by one Aliquot part, and take a part of that quotient for the other aliquot part.

Obſervation 3.

Obſervation 4. The Diviſors (the Aliquot parts into which the prices are parted) ſtand between two lines drawn thus | | and when I take a part of my firſt Quotient, I diſtinguiſh them by a line of ſeparation thus $|\frac{30}{4}|$ which in this caſe doth not ſignifie an improper Fraction, though it bee placed like one, but that when I have divided my given ſumme by 30 for 8 *d.* that I then divide that Quotient by 4, for the 2 *d.* remaining, the price being 10 *d.*

Rule 3. *When the price exceeds a ſhilling, and is under 2 s. you may by obſerving the Method in the two following Examples, reſolve the Queſtion propounded,* viz.

```
1 At 17 d. what |3  |7879  yards
                |4  |2626—4 d.
                      656 —7
                    ________
                 2|1116|9
                  ________
      Anſwer———558—1—11

2 At 23 d. what | 4 | 7879 yards
                | 3 | 1969—9
                | 3 | 2626—4
                      2626—4
                    ________
                   2|1510|1
                    ________
                    | 755—1—5
                    ________
```

In the firſt Example the price being 17*d.* it is apparent there muſt bee 7879 *s.* and ſo many

Obſervation 5

many five pences: So 7879 my number given, I accept as ſhillings, and therefore draw no line underneath it, as in the other Examples, but onely for the 7 *d.* divide by 3 and by 4, and then add the three ſummes together, and divide the total by 20. The other Example is plain, by what hath been ſaid of this; yet theſe Examples likewiſe might have been performed by parting 17 *d.* the price, into the Aliquot parts of 20 *s.* but it being ſomewhat crabbed to a Learner, I omit it. When the price is 15, 16, or 20 *d.* the Queſtions may bee very eaſily performed by the Aliquot parts of 20 *s.* as appears by the firſt Table in this Chapter.

or 7 d. you
ay divide o-
erwaies, as
the ſecond of
e four laſt
xamples in
e ſecond Rule
f this Chapter,
here for 6 d. I
ake ½ and
or 1 d. ⅛ of
at.

Rule 4. *When the price conſiſteth of ſeveral Species or Denominations exceeding thoſe before ſpecified, proceed according to the Direction given for working the following Examples,* viz.

l. s. d.
1 What 125 ½ yards at 2—18—10 ½ the yard.
58

1005. 8. 9.
6250
2 | 62—06—0
3 | 41—08—0
8 | 05—02—2
29—05—1
2 | 738 | 8

l. s. d. q.
Anſwer 369—08—9—3

2 What

l. s. d. q.
2 What 785¼ Ells at 4—17—9—3
97

5495
70650
½ 392—6—0
½ 196—3—0
¼ 49—0—3
48—10—3½
24—05—1½ ¼

2|7689|6

Anſwer 3842—16—2—0—¾.

2 *l.* 18 *s.* is turned into 58 *s.* which in all ſuch caſes you may reduce in your mind without ſetting down any multiplier, then 58 *s.* is multiplied into 125. That done, 10½ *d.* is turned into the Aliquot parts of a ſhilling, and for 6 *d.* I take ½, and for 4 *d.* ⅓, and for ½ *d.* ⅛ of that, then for the ½ yard, I take ½ of 2 *l.* 18 *s.* 10 *d.* ½. Obſervation 6.

The ſecond Example cannot but bee underſtood by theſe Directions upon the firſt.

Rule 5. *If Wares bought bee of one Denomination, and the monies diſburſed of ſeveral Denominations, to know the groſs ſumme to be paid for the Wares bought, you are to obſerve the order of multiplying the following Example by* 8, viz.

l. s. d.
At 5—8—3 $\frac{1}{2}$ the C. what 8 C.
8

Anſwer 43—6—4-0

Here the Anſwer is found to bee

l. s. d. q.
43—6—4-0

thus, *viz.* 8 half-pence is 4 *d.* ſet down 0 in the place of farthings, and carry 4 *d.* then ſay 8 three-pences is 2 *s.* The odd 4 *d.* I ſet down, and carry 2 *s.* in mind, then 8 times 8 *s.* is 64 *s.* and 2 *s.* in mind is 66, the 6 *s.* I ſet down, and carry 3 *l.* laſtly, 8 times 5 is 40, and 3 in mind is 43.

Rule 6. *When you would know the value of a part or peece of the Commodity bought, as a pound, a yard, a C. &c. you are to obſerve the Order of dividing the next Example, which is a proof of the laſt,* viz.

l. s. d.
If 8 C. coſt 43—6—4 the price of a peece will bee 5—8—3 $\frac{1}{2}$ *viz.* 5 times 8 in 43, reſts 3 *l.* which turned into ſhillings, and added to 6 *s.* in the rank of ſhillings make 66, then 8 times 8, which is 64 in 66, reſts 2 *s.* or 24 *d.* which added to 4 *d.* make 28, then 3 times 8 in 28, reſts $\frac{4}{8}$, or $\frac{1}{2}$ *d.*

From the two laſt Rules the Learner may apprehend that it will many times make to his advantage to part, double, or treble the numbers, as there ſhall bee occaſion, *viz.*

```
     l.  s.  d.
  At 6—8—4 per C. what 64 C.
           8
  51—6—8
           8
8|410—13—4
8| 51— 6—8
    6—8—4
```

Here 8 times 8 being 64, I multiply the Summe given by 8, and that product by 8, &c. and the laſt product is an Anſwer to the Queſtion.

Rule 7. *By the former Method of Multiplication, moſt of the material Queſtions, of ſimple Intereſt, loſs and gain, &c. which fall within the compaſs of Commerce, may bee compendiouſly reſolved without the uſe of either of the Golden Rules*, viz.

See the 9 Queſtion in the 15th. Chapter.

What the Intereſt of 938 *l.* for 12 months after the rate of 6 *l.* *per Cent.*

```
          l.  s.  d.  d.
Anſwer   56—5—7—4/5
```

56|28
20
5|60
12
120
60
720

Example 1.

		938
		6
Example 1.	Pounds	56|28
		|20
	Shillings	5|60
		|12
	Pence	7|20
		|4
	Farthings	[illegible]

Obſerve

That although the Multiplier in the Examples in the 5th. and 6th. Rule, bears not the ſame Denomination, as the Multiplier in this Rule; yet the Method of multiplying is directly the ſame, which being performed, I cut off 2 places toward the right hand for reaſon given in the 9th. Rule of the 15th. Chapter, and thoſe figures ſo cut off, I multiply by 20, 12, and 4, to finde the ſhillings, pence and farthings, and in multiplying, I bring down my ſhillings, pence and farthings from their ſeveral ranks, as in the 4th. Example of the ſixth Chapter.

What is the Intereſt of 938 *l.* 17 *s.* 4 *d.* $\frac{1}{2}$ at the rate of 6 *l. per Cent.* Intereſt for 12 months?

l. *s.* *d.* *q.*
Anſwer 56—6—7—2 $\frac{21}{25}$

938

938—17—4—2
6

pounds 56|33—04—3—0
|20

ſhillings 6|64
|12

pence 7|71
| 4

farthings 2|$\frac{84}{100}$|$\frac{42}{50}$|$\frac{21}{25}$|

Rule 8. *If you would diſcover the Intereſt of a ſumme for any number of months under* 12, *firſt multiply the principal by the Rate of Intereſt as before, then for* 3 *months take* $\frac{1}{4}$. *for* 4 *months* $\frac{1}{3}$, *according to the Table, denoting the Aliquot parts of* 12 *in the firſt Rule of this Chapter*, viz.

What

l. *s.* *d.* *qu.*
What 7390—13—11—3 for 9 months
Intereſt at 8 *l. per Cent.* 8

⅔|59125—11—10—0

Anſ. 443 *l.* 8 *s.* 10 *d.* $\frac{13}{50}$ *q.*

29562—15—11—0
14781—07—11—½
443|44—03—10—½
20
8|83
12
10|06
4
0|26|13|
100|50|

Intereſt for Daies.

Rule 9. Intereſt for any number of daies under a month may bee diſcovered by the ſame Order, without any injurious error, viz. When you have found the Intereſt for a year, take $\frac{1}{12}$ thereof for a month, then a month being computed to conſiſt of 30 daies (there is but 5 daies difference in a year, which in ſuch caſes cannot bee of any conſiderable dammage to either party) take the Aliquot parts of that ſumme you take for a month according to the number of daies in the *Queſtion*, *Viz.*

What the Intereſt of 1200 *l.* for 7 daies at 6 *l. per Cent.*

Anſwer 1 *l.* 8 *s.*

If 365 Days — 17280 Pence — 7 Days Ans: 331 Pence [illegible]
7 th remain . wch is 4 [illegible]

the 7 daies I part into 6 and 1, then for 6 daies I take $\frac{1}{5}$, and for 1 day $\frac{1}{6}$ of that.

1200
6
12|72|00
5|6
6)1—4
4
1—8

If the ſumme given be pounds only, the queſtion may more eaſily and ſpeedily bee reſolved by the following Table.

Simple Intereſt at 6 l. per Cent. per annum.

	[1] Month			[2] Months			[3] Months			[4] Months		
l	*l*	*s*	*d*	*l*	*s*	*d*	*l*	*s*	*d*	*l*	*s*	*d*
500	2	10	0	5	0	0	7	10	0	10	0	0
400	2	0	0	4	0	0	6	00	0	8	0	0
300	1	10	0	3	0	0	4	10	0	6	0	0
200	1	0	0	2	0	0	3	0	0	4	0	0
100	0	10	0	1	0	0	1	10	0	2	0	0
90	0	9	0	0	18	0	1	7	0	1	16	0
80	0	8	0	0	16	0	1	4	0	1	12	0
70	0	7	0	0	14	0	1	1	0	1	8	0
60	0	6	0	0	12	0	0	18	0	1	4	0
50	0	5	0	0	10	0	0	15	0	1	0	0
40	0	4	0	0	8	0	0	12	0	0	16	0
30	0	3	0	0	6	0	0	9	0	0	12	0
20	0	2	0	0	4	0	0	6	0	0	8	0
10	0	1	0	0	2	0	0	3	0	0	4	0
9	0	0	9	0	1	6	0	2	3	0	3	0
8	0	0	8	0	1	4	0	2	0	0	2	8
7	0	0	7	0	1	2	0	1	9	0	2	4
6	0	0	6	0	1	0	0	1	6	0	2	0
5	0	0	5	0	0	10	0	1	3	0	1	8
4	0	0	4	0	0	8	0	1	0	0	1	4
3	0	0	3	0	0	6	0	0	9	0	1	0
2	0	0	2	0	0	4	0	0	6	0	0	8
1	0	0	1	0	0	2	0	0	3	0	0	4

But the Intereſt for any number of Daies (when the ſummes given are of ſeveral Denominations) will bee beſt diſcovered by the Rule of Three.

Rule 10. *Queſtions of Compound Intereſt may bee reſolved like theſe of ſimple Intereſt, ciphers being added to the principal propounded, and regard had to the following Method.*

What will 50*l.* principal give after the rate of 6 *l. per Cent. per annum*, being continued out for 3 years at Intereſt upon Intereſt, that is, Intereſt for the principal, and Intereſt for the Intereſt?

Anſwer 59*l.* 11*s.* &c. as will appear by the following operation.

```
 50.00 } Omit to multiply the
     6 } ciphers added to the
 ─────              Principal.
   300
 ─────
 5300.00 first year
       6
 ──────────
   318 00
 ──────────
 5618 00.00 ſecond year
          6
 ──────────
   33708 00
 ──────────
 59|5508 00 third year
         20
 ──────────
 11|0160 00
         12
 ──────────
   1920 00
          4
 ──────────
   7680 00
```

But for calculation of ſuch queſtions, you may compoſe the following Breviate thus, *Viz.*

106 *l.* is the Principal and Intereſt due at firſt years end, which multiplied into 106, gives 11236 for Principal and Intereſt the ſecond year, and that product multiplied into 106, gives 1191016 the third year, &c. When your products exceed 7 places in every operation, cut off the exceſs at the right hand; And after the like Order Tables may bee compo-

ſed for any rate of Compound Intereſt, if you add the rate of Intereſt to 100, and proceed as before.

A Trial of the former Queſtion by the Breviate.

Years	
1	1. 06
2	1. 1236
3	1. 191016
4	1 262476
5	1. 338224
6	1. 418517
7	1. 503628
8	1. 593845
9	1. 689475
10	1. 790843
11	1. 898293
12	2. 012190
13	2. 132921
14	2. 260896
15	2. 396549
16	2. 540341
17	2. 692770
18	2. 854336
19	3. 025596
20	3. 207131
21	3. 399558

Againſt three years you finde 1. 191016, which multiply by 50 *l.* the Principal, then cut off 6 places from the product, and multiply the figures cut off by 20, 12, and 4, and you will finde the Principal and Intereſt 59 *l.* 11 *s.* &c. *Viz.*

1. 191016

1. 191016
50 *l.* principal

Pounds 59|550800
20

Shillings 11|016000
12

No Pence 192000
4

No Farthings 768000

If you omit the Unite in the place next to years, and multiply 191016 *by the Principal, it will give you the Intereſt onely.* Example.

191016
50

9|550800
20

11|016000
12

192000
4

768000

Gain. Rule 1. *Queſtions of loſs and gain after any rate of Intereſt, may bee wrought like thoſe in the 7th. Rule of this Chapter,* viz.

When I pay 148 *l.* for a peece of Cloath, how muſt I ſell the ſame to gain after 8 *per Centum.*

Anſwer, the peeces muſt be ſold for 156 *l.* 16 *s.* 9 *d.* $\frac{1}{2}$, $\frac{2}{3}$ *q.*

6

159

148
8
11 |84
20
16 |80
12
9 |60
4
2 |$\frac{4}{10}$|$\frac{0}{0}$|$\frac{2}{3}$

The operation produceth 11 *l.* 16 *s.* 9 *d.* $\frac{1}{2}$ $\frac{2}{3}$, which added to 148, the price of the Commodity bought, makes 159, 16, 9, $\frac{1}{2}$, $\frac{2}{3}$ for Anſwer.

If a yard of Broad Cloath coſt mee 12*s.* 6*d.* how muſt I ſell the ſame to gain 20*l.* *per Cent.*

Anſwer, at 15 *s.*

12 *s.*—6 *d.*
12
150
20
30|00

Here turning 12 *s.* 6 *d.* into pence, and proceeding as before, you finde 15.

Rule 12. *If you ſell to loſe after either of the former, or any other rate of Intereſt, you are to ſubſtract the ſum ariſing by the Operation of the Queſtion from the price paid, and the Re-* Loſs.

mainder

mainder will bee an Anſwer to the Queſtion, viz. In the laſt Example 30 *d.* (that is, 2 *s.* 6 *d.*) ſubſtracted from 12 *s.* 6 *d.* leaves 10 *s.* which is the ſelling price to loſe after 20 *l.* *per Cent.*

Rule 13. *Queſtions of Wares bought or ſold after fiveſcore to the hundred, or Quintal, may bee likewiſe reſolved after the ſame order.*

When 100 *lb.* coſt 28, 19, 6. what muſt I pay for a *lb.*

Anſwer 5 *s.* 9 *d.* $\frac{1}{2}\frac{4}{25}$ *q.* as will bee apparent by the operation in the Margent.

l.	*s.*	*d.*
28	19	6
20		

5|79
12

9|54
4

2|$\frac{16}{100}$|$\frac{8}{50}$|$\frac{4}{25}$.

There is another plain way commonly uſed by perſons unskilful in Arithmetick.

Rule 14. *When the Summe propoſed may bee diſtributed into ſuch parts as ſucceſſively depend upon one another, like thoſe in the following Examples, the work may bee performed by Addition,* Viz.

What coſt 30 dozen of Gloves at 1 *l.* 19 *s.* *per* dozen?

30 Pounds —— 30 *l.*
The ½ of that 30 Angels —— 15
The half of that 30 Crowns —— 7–10
The half of that 30 Half Crowns—3–15
The ½ of that 30 Shillings, and 30 threepences 03. 17.
The ½ of that 30 Teſters, & 30 three-halfpences 00. 18.

Anſwer —— 59. 11.

What 40 dozen at 18 *s.* 3 *d.*

40 Angels —— 20 *l.*
Then ½ of that 40 Crowns —— 10
Then ½ of that, 40 Half-Crowns — 5
and ½ of that 40 times 15 *d.* — 2–10
added together.

Anſwer—37–10

112 *lb.* at 5 *s.* *per lb.* will coſt 28 *l.* for 112 Crowns is 56 Angels, which is 28 *l.* for the ½ of 112 is 56, and the ½ of 56 is 28. The price of a C. in d. x 7 and ÷ 15 gives the price in pounds, and *e contra*, the price of a C. in *l.* x 15, and ÷ 7 gives the price of a C. in pence. 112 *lb.* at 5 *s.* is 6 c *d.*

60
7

15|420

28
15

7|420

60

See the obſervation at the end of the 5th. Rule in the 15th. Chapter.

Rule 15. The price of 112 *lb.* in ſhillings, x 3 and ⌶ 28 quotes the pence that 1 *lb.* is worth; and, *e contra*, the pence that a *lb.* is worth x 28 and ⌶ 3 quotes the ſhillings that 112 *lb.* are worth.

112 *lb.* at 5 *s.* is 560 ſhillings
3

28)1680 ſhillings

60 pence
28

3|1680

560 ſhillings.

Rule 16. If you buy Yards, Ells, &c. at 120 to the hundred, the half of the price of the Yard or Ell, &c. in pence will bee the value of a 120 in pounds, *viz.*

What 120 Yards at 5 *s.* 8 *d.* *per* Yard?

Anſwer, 34 *l.* for 5 *s.* 8 *d.* turned into pence, is 68, then the half of 68 is 34 *l.* for Anſwer.

What the price of a yard when 120 coſt 34 *l*?

Anſwer, 5 *s.* 8 *d.* The half of the price of 120 yards in pounds, will bee groats, which is the price of the yard, ſo the half of 34 is 17 groats, or 5 *s.* 8 *d.* the price of the yard, &c.

What 120 Ells of Canvas at 9 *d. per* Ell?

Anſwer 4 *l.* 10 *s.* for the half of 9 is 4 ½, then

What the price of an Ell when 120 coſt 4 *l.* 10 *s*?

Anſwer 9 *d.* for the ½ of 4 is 2 groats, then for the odd Angel, add a penny to the two groats, *facit* 9 *d.* and for every Crown ½ *d.* and ſo proportionally, *viz.*

What 120 Stockfiſh at 2 ½ *d. per* Fiſh?

Anſwer, 25 *s.* 2 ½ *d.* reduced is $\frac{5}{4}$, or 25 *s.* then

What the price of a fiſh when 120 coſt 25.

Anſwer, 2 ½ *d.* for every Crown take ½ *d.*

Moſt Queſtions of this nature may be frequently reſolved by memory, without uſe of the Pen. But

Rule 17. *When Queſtions of Weight are propoſed of a different nature, eſpecial regard is to bee had to the Aliquot parts of 112, as they are ſet down at the foot of the 5th. Queſtion in the 6th. Chapter.*

C. qu. lb. l. s. d.

What 9783—3—21 at 3—15—9 *per* C.

75

or ſix pence | 2 | 48915
or three pence | 2 | 68481

4891—6 *d.*
2445—9
37—10—2 *q.* for ½ C.
18—11—1 for ¼
9—05—2 ½ for ½ of ¼.
4—08—3 ¼ for 7 *lb.*

2|74113|3

Anſwer—37056—13—03—0 ¾

Firſt for 3 *l.* 15 *s.* I multiply the ſumme given by 75, then I part 9 *d.* into 6 and 3, and for 6 *d.* take ½ of the ſumme given, and for 3 the ½ of 4891 (the ſumme taken for 6 *d.*) Then for ½ C. the ½ of 3 *l.* 15 *s.* 9 *d.* (the price of C.) for ¼ C. the ½ of that, for 14 *lb.* ½ of that, and for 7 *lb.* the ½ of that.

C. lb. s. d.
What 738 ¾ 26 at 33—8 ½ per C.
33

3 | 2214
3 | 2214
3 | 246
246
30—9 d.—0 q.
8—5—0, &c. for ¼ C.
4—2—2 for 14 lb.
2—1—1 for 7 lb.
1—2—1, &c. for 4 lb 4/7 of ¼.
0—3—2, &c. for 1 lb. ¼ of that
2 | 2489 | 2

Anſwer—1244—12—11—2.

The 26 l. may be otherwiſe parted into Aliquot parts, viz. 16, 8 and 2, then for 16 take 4/7 for 8 ½ of that, and for 2, ¼ of that 4/7 of ¼.

For ¼ C. I take ¼ of 33 s. 8 d. ½ for 14 lb. the ½ of that, for 7 lb. the ½ of that, as in the former Queſtion, then the 5 lb. remaining (of the 26 lb.) I part into 4 and 2, and for 4 lb. take 4/7 (4 times 7 being 28) of 8 s. 10 d. 1 q. which is the price of ¼, and for 1 lb. ¼ of that, in taking whereof there remains ½ d. which may bee caſt away.

C. *q.* *lb.* *d.*
What 378—1—16 at 22 $\frac{1}{2}$ *d.* *per C.*

$\frac{1}{2}$ 189
$\frac{1}{2}$ 94—6
$\frac{1}{2}$ 47—3
1 5—2 $\frac{1}{2}$ *q.* for $\frac{1}{4}$ C.
2—3 $\frac{1}{4}$ for 14 *lb.*
1 $\frac{4}{7}$ for 2 *lb.* $\frac{1}{7}$ of that, or for 16 take $\frac{1}{7}$ of the given price, which is best.

2|70|9

Answer 35—9—2—2 $\frac{5}{8}$.

C. *qu.* *lb.*

See Queſt. 7. Chap. 6.

783—3—25 groſs, Tare 16 *lb.* *per C.* the neat weight at 54 *s.* 9 *d.* *per C.* gives— } *l.* *s.* *d.* *q.* 1838 8 9—1

783—3—25 groſs, Tare 16 *lb.* *per C.* the neat weight at 9 *d.* $\frac{1}{2}$ *per lb.* will give—— } 2979—2—5

See Queſt 6. Chap. 6.

895—3—24 groſs, Tare 14 *lb.* *per C.* and 4 *per* 104 Tret, the neat weight at 3 *l.* 12 *s.* 7 *d.* $\frac{1}{2}$ *per C.* will give—— } 2737—8—10 $\frac{1}{2}$

See Queſt. 10. Chap. 6.

895—3—24 groſs, Tare 20 *lb.* *per C.* and 4. *per* 104 Tret, the neat weight at 11 $\frac{3}{4}$ *d.* *per lb.* will give—— } 3880—8—9

735—2—25 groſs, Tare 18 *lb.* *per C.* and 4 *per* 104 Trett the neat weight at 9¼ *d.* *per lb.* (17 *l.* 13 *s.* 11 *d.* being deducted for cuſtomes and petty charges) gives——— } 2906—4—5

See Queſt. 9. chap. 6.

Silk Weight	Venice Weight
℥.	℥.
12	16
11¼	15
10½	14
9¾	13
9	12
8¼	11
7½	10
6¾	09 — 6 make 8
5¼	08
4½	06
3¾	05
3	04
2¼	03
1½	02
¾	01 and 3 *dr.* ¼.
12 a *lb.* and 12 *dr.* an ℥.	

By this Table you underſtand that 12 ounces Silk Weight make 16 ounces Venice Weight, and 11¼ make 15, &c. Silk-men and Whole-ſale-Haberdaſhers, &c. commonly weigh their wares by Silk-weight, and afterwards convert that Silk-weight into Venice-weight, *viz.* If you buy 9 ℥ of ſilver twiſt, you pay for 12, becauſe 9 ℥ Silk-weight is 12 Venice-weight.

Obſerve, that 3 ounces Silk-weight is 4 Venice-weight, therefore Venice-weight in ounces multiplied by 3, an divided by 4 i Silk-weight i ounces, and, *contra*, Silk-weight in ounces multiplied by 4, and divided by 3 is Venice-weight in ounces.

The following Examples will manifeſt the uſe of the Table.

℥.
16 Venice-weight
3
4|48
12 Silk-weight
4
3|48
16 Venice-weight

| $\frac{3}{8}$ | 10 $\frac{1}{2}$ ℥ *dr.* at 3 *s.* 10 *d.* $\frac{1}{4}$ *per* ℥.
3
30
3—4
5—0
—7—2
1—11—1 $\frac{1}{8}$
—3—3 $\frac{1}{2}$

2|4|1—2

Anſwer 2*l.* 1*s.* 2*d.* 3 *q.*

6,

| 6 ½ ¼ | 58 ¾ ℥ *dr.* at 5 *s.* 8 *d.* ½ *per* ℥.
5

290
09—8
29—0
3—7—2
2—10—1 ½
1—05—0 ½ ¼
—05—2 ⅔

| 2 | 33|2—0—1

16—17—0 ½, &c.

In the firſt Queſtion, when I have taken 1 *s.* 11 *d.* 1 *q.* ½ for my ½ ℥, I take ⅙ of that for a *dr.* 6 *dr.* being ½ ℥.

In the ſecond, when I have taken 1 *s.* 5 *d.* 0 *q.* &c. for ¼ of an ℥, which is the half of 2 *s.* 10 *d.* 1 ½ *q.* the price of ½ ℥, I then take ⅓ of that for a *dr.* becauſe 3 *dr.* make ¼.

933 ½ doz. at 33 *s.* 6 ½ *d.* *per* yard.
933 ½ yards at 17—8 ¾ *per* dozen.

The firſt of theſe two laſt Queſtions propoſed is to be multiplied by 12 to be brought into yards.

The ſecond to bee divided by 12 to bee brought into dozens: So 9 *lb.* 10 ℥ at 5 *s.* 8 *d.* will bee reduced by 12 to 118 ℥, and 118 ℥ at 3 *l.* 8 *s. per lb.* will bee reduced to 9 *lb.* 10 ℥, and the Queſtions may bee then reſolved like thoſe before-going.

For 6*d.* I take ½, and for ½ *d.* $\frac{1}{12}$ of that.

| ½ | $\frac{1}{12}$ |

℥. *dw.* *s.* *d.*
20—14 at 5—6½ *per* ℥.
5

100— 0—0
10— 0—0
—10—0
2—09—1
1—01—1⅕

2| 11|4

5—14—8—2⅕.

The 14 *dw.* is divided into 10 and 4, for 10 *dw.* I take ½ of 5 *s.* 6 ½ *d.* the price of an ℥ (20 *dw.* being an ℥) and for 4 *dw.* ⅕ of 5—6½ *d.* and the Anſwer is 5*l.* 14*s.* 8*d.* 2⅕ *q.*

℥ *dw.* *gr.* *s.* *d.*
The aliquot part for 6*d.* ½ | 83—13—20 at 57—9 *per* ℥.
The aliquot part for 3 ½ | 57—

581
4150 *d.* *q.*

For 6 *d.* —————— 41—06—0
For 3 —————— 20—09—0
For 10 *dw.* ½ the price of an ℥ —— 28—10—2
For 2 *dw.* ⅕ of that —————— 5—09—1⅗
For 1 *dw.* ½ of that —————— 2—10—2 ½ the ½ of ⅕ is $\frac{1}{10}$.
For 12 *gr.* ½ of that —————— 1—5—1 ¼ the ½ of $\frac{1}{10}$ is $\frac{1}{20}$.
For 6 *gr.* ½ of that —————— 0—8—2 ½ the ½ of ¼ is ⅛ the
For 2 *gr.* ⅓ of that —————— 0—2—3 ⅓ ½ of $\frac{1}{20}$ is $\frac{1}{40}$, then
⅓ of ½ is ⅙, and
|2|48|3|3 2 ⅓ of ⅛ is $\frac{1}{24}$, and
⅓ of $\frac{1}{40}$ is $\frac{1}{120}$.

The Anſwer is —— |241—13—2—1 $\frac{3}{10}$

The fractions remaining are $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{10}$ $\frac{1}{5}$ $\frac{1}{20}$ $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{40}$ $\frac{1}{3}$ $\frac{1}{6}$ $\frac{1}{24}$ $\frac{1}{120}$, But I confeſs, that in the Reſolution of this and ſuch like Queſtions, there is no neceſſity of being ſo nice, for all the fractional parts may bee caſt away as inconſiderable; yet this being an excellent queſtion to ſeaſon a Learner, I thought good to inſert it with its Criticiſms, and by way of Encouragement, to reduce the fractions.

Although there are 12 fractions, yet there is only 10 of theſe needful to bee reduced, for the two halfs making a farthing, may bee caſt out in the Reduction.

$\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{4}$ $\frac{1}{20}$ $\frac{1}{8}$ $\frac{1}{40}$ $\frac{1}{3}$ $\frac{1}{6}$ $\frac{1}{24}$ $\frac{1}{120}$, which reduced by the 11th. Rule of the 8th. Chapter the new Numerators, &c. are as in the Margent; which give another farthing, and $\frac{1990656}{6635520}$ q. which may be reduced to $\frac{3}{10}$ then the $\frac{1}{2}$ d. added, give the Anſwer as before.

See the 4th. Queſtion in the 15th. Chapter.

	New Numerators.
1	13271040000
2	06635520000
3	16588800000
4	03317760000
5	08294400000
6	0165888 000
7	11059200000
8	02764800000
9	00552960000
10	22118400000

Common Numerator——86261760000
Common Denominator——66355200000

Fraction remaining—— $\frac{1990656}{6635520}$

A very uſeful Table for Silk-men, &c.

	d		l	s	d
A *lb.* at	6	*per* ounce, &c. is	0	8	0
	7	———	0	9	4
	8	———	0	10	8
	9	———	0	12	0
	10	———	0	13	4
	11	———	0	14	8
	12	———	0	16	0
	13	———	0	17	4
	14	———	0	18	8
	15	———	1	00	0
	16	———	1	01	4
	17	———	1	02	8
	18	———	1	04	0
	19	———	1	05	4
	20	———	1	06	8
	21	———	1	08	0
	22	———	1	09	4
	23	———	1	10	8
	24	———	1	12	0

If the price have one or more farthings adjoyned, for a general Rule, remember for every farthing to add 4 *d. viz.*

A *lb.* at 6 *d.* ¼ *per* ounce is 8 *s.* 4 *d.*
at 6 ½ *per* ounce——8—8
at 6 ¾ *per* ounce——9—0, &c.

Although a Tun of Wine conſiſt of 252 Gallons, at 63 Gallons to the Hogſhead, and 4 Hogſheads to the Tun, yet the Merchants,

chants, caſting away, or allowing 12 Gallons for lees or leakage, &c. commonly compute the Tun to conſiſt but of 240 Gallons, and then ſo many pounds as the Tun coſt, ſo many pence is the price of a Gallon, *viz.* If the Tun coſt 60 *l.* the price of a Gallon will bee 60 *d.* or 5 *s.*

CHAP. 15.

Of the Golden Rule.

1 *THe Golden Rule is either Single or Compound, and is either Direct or Inverſe.*

2 *The Single Rule is termed the Rule of Three, becauſe three numbers are given for the finding out of a fourth, which fourth number in the Rule Direct, bears the ſame proportion to the ſecond, as the third doth to the firſt.*

3 *In the Single Rule, the term upon which the Query is made, doth for the moſt part follow theſe or the like words, viz.* How many? How much? How long? How far? How wide? How deep? What coſt? What muſt? What will? What ſhall? &c.

4 *The numbers given muſt bee ſo ranked, that the term upon which the Query is made, that is, the doubtful or unknown number that you would bee reſolved of, muſt poſſeſs the third place. That of the other two which is of the ſame name or kinde with the third, and commonly follows the word If, or When, muſt ſtand*

in the firſt place, and conſequently that of the like kinde with the fourth term required, in the ſecond place: So if 16 yards coſt 32 *l.* and it bee demanded what 48 yards ſhall coſt, the terms will rank themſelves thus, 16 *y.*—32 *l.* 48 *y.* Queſt. 1.

5 *In the Single Rule Direct, if you multiply the ſecond Term by the third, or the third by the ſecond, and divide the product by the firſt, the quotient will bee the fourth Term ſought*: So if you multiply 48 by 32, or 32 by 48, the product will bee 1536, which divided by 16, quotes 96 the fourth term ſought.

Obſerve that the following Characters ſignifie, *viz.*

1 :: Signifies the middle of 4 proportionals.
2 † More by or added to, and is the ſign of Addition.
3 — Signifies leſs by or ſubſtracted from, and is the ſign of Subſtraction.
4 x Signifies multiplied or drawn into, or multiplied by, and is the ſign of Multiplication.

So the Examples before-going may bee placed thus.

y. *l.* *y.* *l.*
Viz. 16 . 32 :: 48 . 96
As 16 to 32, ſo 48 to 96

That is, if 16 gives 32, then 48 gives 96, Twice 16 is 32, and twice 48 is 96, &c.

5 = Signifieth equal to, as much as, or equal with.

6 ⊥

6. ⌶ Signifies divided by, or meaſured by, and is the ſign of Diviſion.

Queſt. 2. If 48 yards coſt 96 *l.* what will 16 yards coſt? proceeding according to the former order, the terms given, and the term ſought, rank themſelves thus.

        y.   *l.*   *y.*   *l.*
Viz. 48 . 96 : : 16 . 32
As 48 to 96 ſo 16 to 32.

That is, if 48 yards coſt 96 *l.* then 16 yards will coſt 32 *l.* which is an Anſwer to the ſecond, and a proof of the firſt *Queſtion.*

Whence it is apparent, that the 4th. Number is in proportion to the ſecond, as the third is to the firſt. For

In the firſt Example 16 the firſt number is contained 3 times in 48 the third, and 32 the ſecond number is contained 3 times in 96 the 4th. And

In the ſecond Example, as 16 the third number is contained 3 times in 48 the firſt; ſo is 32 the 4th. term contained 3 times in 96 the ſecond.

6 *When the firſt term is contained in the third any certain number of times* neither more nor less *(which often falls out, and is of notable uſe) multiply the ſecond term by the number of times that the firſt is contained in the third, and the Product will bee the 4th. term required:* So in the firſt *Queſtion*

ſtion 48 the third number, contains 16 the firſt 3 times, therefore 32 the ſecond number x by 3 produceth 96 the 4th. term ſought.

7 *When the third term is contained in the firſt any certain number of times, then divide the ſecond number by the number of times that the third number is contained in the firſt, and the Quotient anſwers the Queſtion*: So in the ſecond *Queſtion*, 16 the third term is contained in 48 the firſt, 3 times, therefore 96 the ſecond term ÷ 3 quotes 32 the 4th. term ſought, which likewiſe anſwers the ſecond Queſtion, and proves the firſt.

Queſt. 3 If 987 *l.* 13 *s.* 8 *d.* 3 *q.* buy 73 yards $\frac{1}{4}$, how many yards will 987 *l.* buy?
Anſwer 73 *y.* 3 $\frac{175831}{948179}$ nails.

8 *When the Terms given are of divers Denominations, they muſt bee reduced to the leaſt of thoſe Denominations, viz.* 987 *l.* 13 *s.* 8 *d.* 3 *q.* muſt bee reduced to 948179 *q.* as in the 4th. Example of the 6th. Chapter, and 987 *l.* to 947520 *q.* as in the third Example of the ſame Chapter, alſo 73 $\frac{1}{4}$ yards to 293 *qu.* then by the 5th. Rule of this Chapter the *Quotient* will be 292 $\frac{755293}{948179}$ *qu.* and 292 *qu.* &c. will bee reduced to 73 yards, &c. and the Numerator of the fraction multiplied by 4, the number of Nails in a *Quarter*, according to the Method in the firſt Rule of the 8th. Chapter, and divided by the Denominator, will quote 3 $\frac{175831}{948179}$ Nails, ſo the Anſwer is 73 *y.* 3 $\frac{175831}{948179}$ Nails.

The laſt Queſtion in the fore-going Chapter may bee performed after the ſame order, to prove the practical way of working thereof, *viz.*

Queſt. 4 If I pay 57 *s.* 9 *d.* for an ounce of gold, what muſt I pay for 83 ℥. 13 *dw.* 20 *gr?*
Anſwer 241 *l.* 13 *s.* 2 *d.* 1 $\frac{3}{10}$ *q.*

The Terms rank thus,

℥. *s.* *d.* ℥. *dw.* *gr.*
1—57 9—83—13—20

The third number being propounded in the ſecond Queſtion in the 6th. Chapter is there reduced to 40172 *gr.* the firſt number will bee 480 *gr.* the ſecond will bee 693 *d.* And then proceeding according to the 5th. Rule in this Chapter, the Terms given, and the Anſwer rank themſelves thus,

See Reducti of Troy-weigh

gr. *d.* *gr.* *l.* *s.* *d.* *q.* *q.*
480—693 :: 40172—241—13—2—1 $\frac{3}{10}$.

Queſt. 5 If 48 dozen coſt 16 *l.* what is the price of a dozen?
Anſwer 6 *s.* 8 *d.*

9 *When either of the Terms given is unity, or 1, the Terms rank themſelves as before, but neither of the other two Terms given, can bee encreaſed or diminiſhed thereby, becauſe 1 neither multiplies nor divides;* Therefore the Anſwer in this caſe will bee found $\frac{16}{48}$ *l.* which by the fourth and firſt Rules of the 8th. Chap-

When either of the terms given is unity or 1.

ter will bee reduced to $\frac{1}{3}$ *l.* or 6 *s.* 8 *d.* ſo the Terms given, and the Anſwer will bee ranked thus,

doz. *l.* *doz.* *s.* *d.*
48 — 16 : : 1 — 6 — 8

In ſuch caſes it is the beſt way to abbreviate the fraction to the known part of a pound, &c. 16 *l.* the Dividend might have been reduced to ſhillings, and ÷ 48 which would have produced the ſame Anſwer, but the Operation that way is not ſo Artificial or Expeditious.

Queſt. 6 If $\frac{1}{8}$ *y.* coſt $\frac{1}{3}$ *l.* what ſhall $\frac{3}{8}$ *y* coſt?

Anſwer 20 *s.*

10 *When the Terms given are ſingle fractions, x the Denominator of the firſt Term into the Numerators of the ſecond and third Terms continually*, and the Product conſtitutes a new Numerator, or Dividend. Alſo x the Numerator of the firſt Term into the Denominators of the ſecond and third continually, and the Product will be a new Denominator or Diviſor: So 8 x 1, and 3 the Product is 24 for a new Numerator, and 1 x into 3 and 8, the product is 24 for a new Denominator or Diviſor, and the Anſwer will bee found $\frac{24}{24}$, which is an Integer, or 20 *s.*

Or x $\frac{1}{3}$ and $\frac{3}{8}$ the ſecond and third numbers by the firſt Rule of the 11th. Chapter, and the Product will bee $\frac{3}{24}$, then by the firſt Rule of the 12th. Chapter $\frac{3}{24}$ ⌶ by $\frac{1}{8}$, the Anſwer will bee found as before $\frac{24}{24}$.

Queſt. 7. If 3 $\frac{1}{8}$ *l.* buy 7 $\frac{1}{4}$ *y.* what will 6 $\frac{1}{3}$ *l.* buy?

Anſwer 14 $\frac{1}{2}$ yards.

11 *When the numbers given are mixt or compounded, reduce them into improper fractions, by the 7th. Rule of the 8th. Chapter, and then proceed as in the laſt Rule, and you will finde the Terms here given, and the Anſwer to ſtand thus*, Viz.

l. *y.* *l.* *y.*

$\frac{19}{8}$ — $\frac{29}{4}$: : $\frac{19}{3}$ — 14 $\frac{1}{2}$

Queſt. 8 What muſt I pay for 16 $\frac{5}{8}$ *gr.* when 1 $\frac{5}{6}$ *lb.* coſt 50 *l*?

Anſwer 1 *s.* 6 *d.* 3 *q.* $\frac{35}{44}$.

12 *When the firſt and third Terms in a Queſtion propounded, are not of the ſame particular Denomination, reduce the Term of the leſſer Denomination to that of the greater.*

Firſt the Terms rank thus,

lb. *l.* *gr.*

1 $\frac{5}{6}$ — 50 — 16 $\frac{5}{8}$

The third Term being not of the ſame Denomination with the firſt, is reduced to the Improper Fraction $\frac{133}{8}$, of $\frac{1}{24}$, of $\frac{1}{20}$, of $\frac{1}{12}$, which compound Fraction by the 10th. Rule of the 8th. Chapter will bee found $\frac{133}{46080}$ *lb.* then the Terms rank thus,

$\frac{11}{6}$ *lb.* $\frac{50}{1}$ *l.* $\frac{133}{46080}$, and proceeding as in the 10th. Rule, the Anſwer will bee $\frac{1155}{14688}$ *l.* which by the firſt, ſecond and third Rules of the 8th. Chapter may bee reduced to 1 *s.* 6 *d.* 3 *q* $\frac{21}{44}$ *q.* and then the 4 Terms ſtands thus, *viz.*

$\frac{11}{6}$ *lb.* $\frac{50}{1}$ *l.* :: $\frac{133}{46080}$ — $\frac{1155}{14688}$,

Or,

$\frac{11}{6}$ *lb.* $\frac{50}{1}$ *l.* :: $\frac{133}{46080}$. 1 *s.* 6 *d.* 3 *q.* $\frac{21}{44}$.

Or the firſt number which is of the greater Denomination, may bee reduced to that of the leaſt, and then the terms will rank thus, *Viz.* $\frac{10560}{1}$ — $\frac{50}{1}$ — $\frac{133}{8}$, and the Operation and Anſwer will bee the ſame.

Queſt. 9 If 100 *l.* gives 8 *l.* 200 *l.* will give 16 *l.* for 1600 the product of the ſecond number x by the third ÷ by 100, that is, two ciphers cut off towards the right hand (according to the 29th. Rule of the 5th. Chapter) quotes 16. In the Operation of thoſe Queſtions in the 7th. 8th. 9th. 11th. 12th. and 13th. Rules of the 14th. Chapter, two places towards the right hand are cut off in every rank, according to the continuation of the Queſtions, becauſe the Diviſor in each queſtion, had it been ſet as a queſtion in the Rule of Three, would have been 100, as infallibly it will in all queſtions of like nature.

ee the Que-
ion at the
oot of the 7th.
ule in the
4th. Chapter,
c.

Viz. 100 *l.* 6 *l.* :: 938 *l.* 56 $\frac{7}{25}$ *l.*

roof of the
ule Direct.

13 If the operation bee rightly performed, the product of the 4th. Term x the firſt will bee = to the product of the ſecond term x by the third: So in the firſt Example 96 the

fourth Term x, 16 the firſt is = 1536 the product of the ſecond Term x the firſt, and in the laſt queſtion the product of 19 the firſt number x 14 $\frac{1}{3}$ the fourth number is = $\frac{831}{3}$ the product of the ſecond number x the third.

When a queſtion is propounded, it will concern the Learner to caſt about, and contrive the operation thereof the moſt advantagious way.

Queſt. 10 Admit this queſtion were propounded, *viz.*

I bought wares for 140 *l.* 10 *s.* and would ſell them with loſs of 8 *l. per Centum*, what monies muſt I receive?

Anſwer 129 *l.* 5 *s.* 2 *d.* $\frac{3}{5}$.

This queſtion may bee performed five ſeveral waies, *viz.*

		l. — *s.*
1. By practice		140 — 10
		8
l.	*l.* *s.* *d.* *q.*	
2. 100. loſeth	8 — 0 — 0 — 0	11 | 24 — 0
		20
40. $\frac{2}{5}$ of that	3 — 4 — 0 — 0	4 | 80
		12
s. 10. $\frac{1}{40}$ of that	0 — 0 — 9 — 2 $\frac{2}{5}$	9 | 60
		4
	11 — 4 — 9 — 2 $\frac{2}{5}$	2 | $\frac{40}{100}$ | $\frac{2}{5}$

l. l. l. s. l. s. d. q.
3. 100—8 :: 140—10—11—4—9—2 $\frac{2}{5}$ *q.*
Angels *l.* Angels
4. 200—8 :: 281———11—4—9—2 $\frac{2}{5}$,
wch. 4 ſeveral waies produce 11—4—9—2 $\frac{2}{5}$, and that ſubſtracted from 140 *l.* 10 *s.* leaves 129 *l.* 5 *s.* 2 *d.* 1 *q.* $\frac{2}{5}$ *q.* the monies to bee received.

l. l. l. s. l. s. d. q.
5. 100—92 :: 140—10—129—5 2 1 $\frac{2}{5}$.
at one operation without any ſubſtraction, which is beſt.

CHAP. 16.

Of the Golden Rule, or Rule of Three Inverſe.

1

THis Rule differs from the former in the manner of operation onely, for it conſiſts of three numbers, and a fourth in proportion is required, which fourth term (the term ſought or inquired after) bears the ſame proportion to the ſecond term, as the firſt doth to the third.

2 *Before you proceed to any Example in this Rule, conſider whether more or leſs bee required.*

Leſs required. 3 *If leſs bee required, that is, a fourth number leſs than the ſecond, then the greater of the two Extreams is Diviſor.*

More required. 4 *If more bee required, that is, a fourth number greater than the ſecond, the leſſer Extream is the Diviſor.*

The following Examples and Obſervations will exemplifie the Rule.

Any number between 2 is a mean, the other two are extreams.

Queſt. 1 If 16 Pioners caſt up a work in 24 daies, in how many daies will 32 perform the like ſervice ?

Anſwer 12 daies

Men Daies Men
16 —— 24 —— 32

5 *Multiply the firſt term by the ſecond, or the ſecond by the firſt, and divide the product by the third, and the Quotient will give the 4th term required :* So 16 x 24 = 384 which ⌶ 32 quotes 12 the 4th. Term ſought. The more the men, the leſs the time, therefore the 4th. proportional required being leſs than the ſecond, 32 the greater Extream is Diviſor, and 12 the 4th. proportional may bee found twice in 24 the ſecond number, as 16 the firſt may in 32 the third.

*Q*ueſt. 2 The fewer the men, the longer the time, therefore

Men Daies Men.
32 — 12 —— 16

A fourth number being required greater than the ſecond, 16 the leſſer extream is Diviſor, and the fourth proportional ſought is 24, which anſwers the ſecond *Q*ueſtion, and proves the firſt, and contains 12 the ſecond number twice, as 32 the firſt, doth 16 the third.

To diſcern which of the Rules anſwers the queſtion propounded.

Obſerve, That the Diviſor in the Rule Direct is the firſt Term, and in this the third, for from thence you may diſcover which of the Rules will anſwer the queſtion propounded.

Queſt. 3 If a yard in breadth have 24 yards in length, what length will three quarters breadth require?

qu. breadth . length . qu. breadth.
4 . 24 . 3

Anſwer 32.

Here it is apparent more is required, for the leſſer the breadth, the greater the length, therefore $\frac{3}{4}$ muſt have more length than a yard; ſo the Anſwer will bee found 32.

Queſt. 4.

qu. breadth . length . qu. breadth.
3 . 32 . 4

Here the fourth proportional will bee found 24, which proves the firſt, and anſwers the laſt of theſe two queſtions.

Queſt. 5 If $\frac{5}{8}$ breadth require $\frac{2}{3}$ length, what length will $\frac{3}{8}$ breadth require?

Anſwer 1 $\frac{1}{9}$ length.

Rule of Three Inverſe in Fractions.

When the fractions are mixt or compounded, they muſt bee reduced, then, as in this Rule, the product of the Numerators of the firſt and ſecond terms, and the Denominator of the third multiplied continually is new Numerator or Dividend, and the product of the Denominators of the firſt and ſecond terms, and Numerator of the third ſo multiplied, is Denominator or Diviſor: So 5 and 2 the Numerators of the firſt and ſecond Terms x 8 the Denominator of the third produceth 80 for a new Numerator or Dividend, and 8 and 3 the Denominators of the firſt and ſecond terms x 3 the Numerator of the third produceth 72 for Denominator or Diviſor, and the Anſwer will bee found $\frac{80}{72}$, or $1\frac{1}{9}$ in length.

Or multiply $\frac{5}{8}$, and $\frac{2}{3}$ the two firſt terms together, and divide the product by $\frac{3}{8}$, and the Anſwer will bee the ſame.

Queſt. 6 If a penny loaf weigh $6\frac{1}{2}$ ounces weight, when Wheat is at $12\frac{1}{2}$ *s. per* quarter, what muſt it weigh when Wheat is ſold at $16\frac{2}{3}$ *s. per* quarter?

The terms reduced to improper fractions.

Anſwer $4\frac{7}{8}$ ℥. for the greater the price of the grain, the leſſer the weight of the bread.

The terms reduced rank thus.

$\frac{25}{2}$ *s.* $\frac{13}{2}$ ℥. $\frac{50}{3}$ *s.* and working as before, the Anſwer will bee found $4\frac{7}{8}$ ℥.

The proof of this Rule may bee made by an Inverſion of the queſtions as before, but the following proof will bee more familiar to a Learner.

Proof of the Rule Inverſe.

7 *If the Product of the third Term* x *by the fourth, agree with the product of the firſt Term multiplied by the ſecond, the work is well performed, otherwiſe 'tis errovious:* So the product of 16 x 24 in the firſt Example is = to 384 the product of 32 the third number x 12 the fourth.

CHAP. 17.

The Double Golden Rule Direct and Inverſe.

1.

THe Double Golden Rule is likewiſe Direct or Inverſe.

2 In this Rule five Terms are propounded, the three firſt contain a ſuppoſition, the two laſt an Interrogation, and a ſixth term is ſought.

3 In the Direct Rule, before the Operation of the Queſtion, the 5 terms given are to bee ſo ranked, that the firſt, and the fourth may bee of one Denomination, and the ſecond, and the fifth of another, and when the queſtion is anſwered, the ſixth proportional found will bee of the ſame Denomination with the third.

Rule Direct. Qu. 1 If 8 men in 24 daies reap 48 Acres of Wheat, how many Acres will 32 men reap in 96 daies?

Anſwer 768 Acres

Men	Daies	Acres
8	24	48
32	96	

The product of the three laſt numbers 48, 32. and 96, multiplied continually for Dividend, and 8 and 24, the firſt and ſecond for Diviſor, the Quotient will bee found 768, which is an Anſwer to the Queſtion, and the Terms ſtand thus.

Men Daies Acres
8——24——48
32——96——768

5 *In the former Queſtion, and ſo in all others in the Rule Direct, if the terms bee orderly ranked, the fourth will ſtand under the firſt, and the fifth under the ſecond, and under the third is a Blank, which is filled with the ſixth number found.*

Rule Inverſe. How to know the Direct Rule from the Inverſe Rule.

6 *In the Rule Inverſe the Blank will fall under the firſt or ſecond number, as in the following Queſtions, and then the firſt, ſecond and laſt Terms multiplied continually for Dividend, and the third and fourth for Diviſor, the Quotient will anſwer the Queſtion.*

Queſt. 2 If 32 men in 96 daies mow 768 Acres, how many men in 24 daies will mow 48 Acres?

Anſwer 8 men.

Men Daies Acres
32——96——768
24——048

Then 32, 96, and 48 multiplied for Dividend, and 768 and 24 for Diviſor, 8 the Quotient anſwers this Queſtion, and proves the former, and then the Terms given, and the Anſwer rank thus,

Men Daies Acres
Viz. 32——96——768
8——24——048

Queſt. 3 If 12 Horſes in 15 weeks eat 60

Buſhels of Corn, how many Horſes in 45 weeks will 180 Buſhels feed at the like allowance?

Buſhels Horſes Weeks
60 —— 12 —— 15
180 —— —— 48

Now multiplying and dividing as in the laſt Example, the ſixth number found will bee 12, and the 5 numbers given, and the 6th. found will ſtand thus,

Buſh. Horſes Weeks
60 —— 12 —— 15
180 —— 12 —— 45

Obſervation, Many of the moſt neceſſary Queſtions of Intereſt, and Loſs, and Gain, &c. though they are uſually anſwered by the ſingle Rule at two Operations, or the Double Rule at one, yet they may with more facility and dexterity bee ſometimes reſolved by the Rules of Practice, *viz.*

Queſt. 4 If 100 *l.* in 12 months gain 8 *l.* what 7390 *l.* 13 *s.* 11 *d.* 3 *q.* in 9 months? The Terms reduced ſtand thus,

q. Months *l.*
96000 — 12 — 8
7095071 — 9 ——

Then proceeding according to the fourth Rule of this Chapter, the Terms given, and the Anſwer will rank thus,

q. Months *l.*
96000 — 12 — 8
7095071 — 09 — 443 — 8 *s.* — 10 *d.* [illegible] *d.*

The moſt Methodical Operation of this Queſtion by this Rule, requires about 300 figures more than the practical way, the figures therefore being more numerous, the Operation cannot but bee more tedious, and ſo conſequently the practical way is the beſt. Queſtions of like kinde with that which follows muſt bee reſolved by the ſingle Rule at 2 Operations, or the double Rule at one, *viz.*

See the ſame Queſtion wrought in the 8th. Rule of the 14 Chapter.

Queſt. 5 What was the mony that gained 100 *l.* in 7 months after the rate of 8 *l.* in the 100 *l.* for 12 months?

Anſwer 2142 $\frac{5}{7}$ *l.*

The Terms rank thus,

l. Months *l.*
100——12——8
——7—100

And then proceeding according to the fifth Rule, the five Terms given, and the ſixth Term found ſtand thus,

l. Months *l.*
100——12——8
2142 $\frac{6}{7}$——7——100

The Compound Rule Direct in Fractions.

Queſt. 6 If 66 $\frac{2}{3}$ *l.* principal in $1\frac{1}{2}$ a year raiſe 5 *l.* Intereſt, what Intereſt will 800 *l.* principal raiſe in $\frac{1}{2}$ year.

Anſwer 20 *l.*

First the Terms given ſtand thus,

66 $\frac{2}{3}$ *l.* 1 $\frac{1}{2}$ year 5 *l.*
800. $\frac{1}{2}$

Secondly, the Terms given reduced by the 7th. and 9th. Rules of the 8th. Chapter, ſtand thus,

$\frac{200}{3}$ *l.* $\frac{3}{2}$ year $\frac{5}{1}$ *l.*
$\frac{800}{1}$ $\frac{1}{2}$

7 *The product of the Denominators of the two firſt Terms multiplied continually into the Numerators of the three laſt Terms is Numerator or Dividend, and the product of the Numerators of the two firſt Terms ſo multiplied into the Denominators of the three laſt Terms is Denominator or Diviſor,* and by the work the Anſwer will bee found 20 *l.*

The Compound Rule Inverſe in Fractions.

Queſt. 7 *If* 800 in $\frac{1}{2}$ year raiſe 20 *l.* Intereſt, in what time will 66 $\frac{2}{3}$ *l.* raiſe 5 *l.* Intereſt?

5 *l.* reduced into $\frac{5}{1}$ by the 9th. Rule of the 8th. Chapter.

The Terms reduced rank thus,

l. *y.* *l.*
$\frac{800}{1}$ $\frac{1}{2}$ $\frac{20}{1}$
$\frac{200}{3}$ $\frac{5}{1}$

Anſwer 1 $\frac{1}{2}$.

8 *The product of the Numerators of the firſt, ſecond and fifth Terms multiplied continually into the Denominators of the third and fourth, is Numerator or Dividend, and the product of the Denominators of the firſt, ſecond and fifth Terms ſo multiplied into the Numerators of the third and fourth, is Denominator or Diviſor:* And the 6th. proportional which anſwers this Queſtion, and proves the laſt will bee found 1 $\frac{1}{2}$ year; Or the firſt of the two laſt Queſtions may bee performed by the ſingle Rule at two Operations.

Viz. 1 | $\frac{3}{8}$ year, $\frac{5}{1}$ $\frac{1}{63}$ year, 1 $\frac{2}{3}$ m.

2 | $\frac{200}{3}$ $\frac{5}{3}$ $\frac{800}{3}$ l. 20 l.

The laſt Queſtion thus.

1 | $\frac{800}{1}$ $\frac{20}{1}$ $\frac{5}{1}$ $\frac{3200}{3}$ l. $\frac{64}{3}$ l.

2 | $\frac{5}{3}$ l. $\frac{4}{2}$ years $\frac{5}{1}$ 1 $\frac{1}{2}$ year.

Or the firſt Queſtion ſtanding thus reduced.

Viz. l. $\frac{800}{3}$ y. $\frac{7}{3}$ l. $\frac{5}{1}$ l. $\frac{800}{1}$ m. $\frac{1}{2}$

9 *The three laſt Terms multiplied together, will produce* $\frac{4000}{2}$ *for a Dividend, and the two firſt multiplied together* $\frac{800}{6}$ *for Diviſor*; And the Anſwer will bee found 20 *l.* as before.

The ſecond thus l. $\frac{800}{1}$ y. $\frac{3}{2}$ l. $\frac{20}{1}$ l. $\frac{200}{3}$ m. $\frac{5}{1}$

10 *The firſt, ſecond and fifth Terms multiplied together, will produce* $\frac{4000}{2}$ *for Dividend, and the ſecond and fourth multiplied together* $\frac{4000}{3}$ *for Diviſor*. And the Anſwer will bee *prout ſupra* 1 $\frac{1}{2}$.

Obſerv. 1. Of theſe double Rules there are divers kinds and varieties, according to the nature of the Queſtion propounded, and that the three laſt Queſtions may not ſeem to bee inſerted and reſolved more for delight than neceſſity, it is not amiſs to let the Learner know, that by the various waies of working thoſe Queſtions, hee will finde I did only indeavour his advantage, for if hee entertain the trouble of underſtanding them effectually in their ſeveral operations, hee will bee the ſooner led to the knowledge of thoſe that follow, which are many times materially ſignificant in relation to Merchandize, as Rebate, Equation of Barters, Exchange, Reduction of mony, Weight, Meaſure, &c. And alſo to Charges of War, as Victuals, Souldiers Wages, Expences of Powder, caſting up of Trenches, and other Military matters, by which Rules many Queſtions of like nature are ſpeedily and aptly diſcuſſed.

Queſt. 8. If 2 Souls bee worth 8 Liures, and 8 Liures bee worth 2 Franks, how many Souls muſt bee given in Exchange for 48 Franks?

Anſwer 20 Souls.

Obſerv. 2. The number of Terms in this Queſtion are equivalent to thoſe in the former, the Difference is, that in thoſe the three firſt Terms contain a Suppoſition, and the two laſt a Demand, and in this the four firſt Terms contain the Suppoſition, and the fifth the Demand; that is, in thoſe Queſtions there are two Interrogatory Terms, in this but one.

Queſtions of like nature with thoſe that follow, are plainly, and clearly, and with moſt eaſe to the Learner, anſwered by the ſingle Rule at two or more operations, and therefore I think fit to obſerve that order firſt, and for the Learners advantage to invert ſome of the Queſtions for proof of the work.

Caution, In Queſtions anſwerable by theſe Rules, ſometimes the Proportions will bee Direct, ſometimes Inverſe; ſometimes the firſt Direct, the latter Inverſe; ſometimes the firſt Inverſe, the latter Direct: therefore the Learner muſt take care to carry a diligent eye upon the Rule that concerns the Queſtion.

Liures Souls Liures Souls,
If 8 —— 2 :: 5 —— 1 $\frac{1}{4}$ then
Franks Souls Franks Souls
If 3 —— 1 $\frac{1}{4}$ :: 48 —— 20

Both proportions anſwered by the Rule Direct.

The Queſtion inverted for proof.

If 3 Franks bee 5 Liures, and 8 Liures 2 Souls, how many Franks in 20 Souls?

Anſwer 48 Franks.

Livers Franks Livers Franks
If 5 —— 3 :: 8 —— 4 $\frac{4}{5}$ then
Souls Franks Souls Franks
If $\frac{2}{1}$ —— 4 $\frac{4}{5}$ :: 20 —— 48

Queſt. 9 If 100 *lb.* at Peroſe bee 90 *lb.* at Sene, and 100 *lb.* at Sene 120 *lb.* at Piſe, how many *lb.* at Piſe in 300 *lb.* at Peroſe?

Anſwer 324 at Piſe.

Sene Piſe Sene Piſe
If 100 —— 120 :: 90 —— 108 then
Peroſe Piſe Peroſe Piſe
If 100 —— 108 :: 300 —— 324

Both proportions anſvered by the Rule Direct.

The Queſtion inverted for proof.

If 120 *lb.* at Piſe be 100 *lb.* at Sene, and 90 *lb.* at Sene 100 at Peroſe, how many *lb.* Peroſe in 324 Piſe?

Sene Peroſe Sene Peroſe
If 90 —— 100 :: 100 —— $111\frac{1}{9}$
Piſe Peroſe Piſe Peroſe
If 120 —— $111\frac{1}{9}$ :: 324 —— 300

How the two laſt *Queſtions* are anſwered, and how inverted and proved, cannot but bee obvious to the Learner, who may further obſerve, that the Terms of the firſt *Queſtion* may bee ranked as followeth.

Souls Liures Liures Franks Souls
Viz. 2 —— 8 —— 5 —— 3 —— 20

Obſerv. 3. The firſt and the laſt Term are of one Denomination,
The ſecond and third of another, And
The fourth and ſixth of another.

The ſame in Fractions.

The product of 8, 3, *and* 20, *the ſecond fourth and fifth Terms multiplied continually is Dividend, and the Product of* 2 *and* 5 *the firſt and third ſo multiplied is Diviſor, and the Anſwer the ſame.*

Obſerv. 4. At the foot of every Term multiplied for Dividend, and the head of every Term multiplied for Diviſor, there is placed a point, prick or period.

Again,

Peroſe Sene Sene Piſe Peroſe
If 100. 90. 100. 120. 300

Proceeding as in the laſt Rule, the Anſwer will bee the ſame, as in the 9th. Queſtion.

Queſt. 10 If 4 Rubles countervail 40 Souls, and 24 Souls 4 French Crowns, how many Rubles will countervail 20 French Crowns?

Anſwer 12 Rubles.

	Souls	Fr. Crowns	Souls	Fr. Crowns
If	24 .	4 ::	40 .	$6\frac{2}{3}$

	Fr. Crowns	Rubles	Fr. Crowns	Rubles
If	$6\frac{2}{3}$.	4 ::	20 .	12

Or thus,

	Rubles	Souls	Souls	Fr.Crow.	Fr.Crow.	
If	4 .	40 .	24 .	4 .	20	=

Obſerv. 5. Here the ſecond and third terms are of one Denomination.

The fourth and fifth of another, And

The firſt and ſixth of another.

The product of 4, 24, *and* 20 *the firſt, third, and fifth Terms* x *continually is Dividend, and the product of* 40, *and* 4 *the ſecond and fourth Terms, ſo* x *is Diviſor, and the Anſwer* 12 *Rubles.*

Queſt. 11 If $\frac{3}{4}$ of a pound ſterling bee $\frac{7}{8}$ of a pound Flemmiſh, and $\frac{1}{12}$ of a pound Flemmiſh $\frac{3}{5}$ of a pound Turnois, what parts of a pound ſterling are $\frac{8}{9}$ of a pound Turnois?

Anſwer $\frac{20}{189}$, which are = $\frac{8}{9}$ *l.* Turnois.

Sterl.	Flem.	Flem.	Turnois	Turnois
$\frac{3}{4}$.	$\frac{7}{5}$.	$\frac{1}{12}$.	$\frac{3}{8}$.	$\frac{8}{9}$

$\frac{1}{18}$ the product of $\frac{3}{4}$, $\frac{1}{12}$ and $\frac{8}{9}$ the firſt, third and fifth numbers x continually is Dividend.

$\frac{21}{40}$ the product of $\frac{7}{5}$, and $\frac{3}{8}$ the ſecond and fourth number x continually is Diviſor, and the quotient $\frac{20}{189}$ for Anſwer.

Or 960 the product of 5 and 8 the Denominators of the ſecond and fourth Terms x *continually in 3, 1, and 8 the Numerators of the firſt, third, and fifth Terms, is Numerator or Dividend; and 9072 the product of 4, 12, and 9, the Denominators of the firſt, third, and fifth Terms* x *continually into 7 and 3 the Numerators of the ſecond and fourth Terms; is Denominator or Diviſor,* and the Anſwer $\frac{20}{189}$ *prout ſupra.*

Queſt 12. If 35 Ells of *Vienna* make 24 at *Lyons*, and 3 Ells of *Lyons* 5 Ells of *Antwerp*, and 100 Ells of *Antwerp* 125 Ells at *Frankfort*, how many Ells at *Frankfort* make 42 at *Vienna*?

Anſwer 60 Ells at *Frankfort*.

Ells at *Vienna*	Ells at *Lyons*	Ells at *Lyons*	Ells at *Antwerp*	Ells at *Antwerp*	Ells at *Frankfort*	Ells at *Vienna*
35 .	24 .	3 .	5 .	100 .	125 .	42

Obſerv. 6. Here the firſt and ſeventh Terms are of one Denomination.

The ſecond and third of another.

The fourth and fifth of another. And
The ſixth and eighth of another.

The product of 24, 5, 125, and 42, the ſecond, fourth, ſixth and ſeventh terms multiplied continually, is Dividend. And the product of 35, 3, and 100 the firſt, third, and fifth terms ſo multiplied, is Diviſor, and the Anſwer 60 Ells of *Frankfort*.

Or thus,

Ells at *Antwerp*	Ells at *Frankfort*		Ells at *Antwerp*	Ells at *Frankfort*
100 ——	125	::	5 ——	$6\frac{1}{4}$
At *Lions*	*Frankfort*		at *Lions*	*Frankfort*
3 ——	$6\frac{1}{4}$	::	24 ——	50
At *Vienna*	*Frankfort*		at *Vienna*	*Frankfort*
35 ——	50	::	42 ——	60

The proportions direct.

Queſt. 13. If a yard of Cloath delivered for 2 *s.* 6 *d.* to bee paid at 3 months gain 50 *l. per Cent.* in 12 months, what coſt the yard ready money?

Anſwer $\frac{1}{9}$ *l.*

mo.	*l.*		mo.	*l.*
12	50	::	3	$12\frac{1}{2}$
l.	*l.*		*d.*	*l.*
$112\frac{1}{2}$.	100	::	30	$\frac{1}{9}$

When the queſtion is ſet 112, $\frac{1}{2}$ muſt bee reduced to *d.* to agree with the 3d. number.

The Queſtion inverted for proof.

Queſt. 14. If a yard at $\frac{1}{9}$ *l.* ready money, bee ſold for $\frac{1}{8}$ to bee paid at 3 months, what is gained upon the 100 in 12 months?

Anſwer 50 *l.*

The difference of the firſt price ſubtracted from the latter, that is, $\frac{1}{9}$ from $\frac{1}{8}$ (2 *s.* 2 *d.* $\frac{2}{3}$ *d.* from 2 *s.* 6 *d.*) there reſteth 3 $\frac{1}{3}$ *d.* gains, then

If $\frac{80}{3}$ *d.* $\frac{10}{3}$ *d.* :: $\frac{24000}{1}$. 3000 *d.*
If 3 mo. 3000 *d.* :: 12 mo. 12000 *d.*

Or thus,

The Rule Direct anſwered by the 6th. Rule in this Chapter.

$\frac{1}{9}$ *l.* $\frac{3}{1}$ mo. $\frac{10}{3}$ *d.*
$\frac{100}{1}$ $\frac{12}{1}$ And the Anſwer will bee 50 *l.* *prout ſupra.*

Queſt. 15. If a yard which coſt $\frac{1}{9}$ *l.* ready money, bee ſold for $\frac{1}{8}$, how long time muſt bee given for payment thereof, to gain after 50 *l.* in the 100 for 12 months?

Anſwer 3 months.

The Rule Inverſe.

$\frac{100}{1}$ *l.* 12 mo. 50 *l.*
$\frac{80}{3}$ $\frac{10}{3}$ work according to the 7th. Rule.

Queſt, 16 How muſt I ſell a yard which coſt $\frac{1}{9}$ *l.* ready money, and give 3 months day of payment to gain after 50 *l.* in the 100 for 12 months?

Anſwer $\frac{1}{72}$ *l.*

The Rule Direct.

l. mo. *l.*
100——12——50
$\frac{1}{9}$—— 3 The term ſought will bee $\frac{1}{72}$, which is 3 $\frac{1}{3}$ *d.* wherefore the yard muſt bee retailed for ſo much more than it coſt, that is, 2 *s.* 6 *d.* to gain after the rate required.

Queſt. 17 If 100 *l.* ſtock in 12 months gain 50 *l.* what ſtock in 3 months will produce $\frac{1}{72}$ *l.* gains?

Anſwer $\frac{1}{9}$ *l.*

The Rule Inverſe.

l. mo. *l.*
100 —— 12 —— 50
3 —— $\frac{1}{72}$

Queſt. 18 If 6 *d.* Wine ſatisfie 4 men, when Wine is at 12 *d. per* quart, how many men will 72 *d.* of Wine ſatisfie, when Wine is at 8 *d. per* quart?

The firſt part Direct, the latter Inverſe.

d. men *d.* men
6 —— 4 :: 72 —— 48
d. wine men *d.* wine men
12 48 :: 8 72

Queſt. 19 If a penny Loaf weigh 15 ℥ when Wheat is at 18 *s. per* quarter, what muſt a two-penny Loaf weigh when wheat is at 10 *s. per* quarter?

The firſt part Inverſe, the latter Direct.

Anſwer 54 ℥.

s. ℥. *s.* ℥.
18 —— 15 :: 10 —— 27
d. loaf *d.* loaf ℥.
1 —— 27 :: 2 —— 54

CHAP.

CHAP. 18.

Of Rebate or Diſcompt, and Equation of Payment.

THe many Tables extant for reſolving queſtions of Rebate, were certainly framed to rectifie the miſchiefs which daily ariſe, by deſign or ignorance, to the Detriment of the Merchant, and by the way of Reaſon and Proportion to point out a punctual method equally honeſt and indifferent to all men, towards which good work I have already contributed my Mite, and made known ſeveral erronious operations, practiſed, to the prejudice of thoſe perſons who were not qualified to underſtand the different waies of working queſtions of that nature, notwithſtanding all which, ſtill finding (which is ſomewhat of wonder) ſome men, rational men, of long ſtanding in Trade, ſo ſtrangely devoted to their old Tract, as to rely upon practical Rules built upon rotten foundations, to their frequent loſs, I have thought fit once more to endeavour to undeceive them.

1 *Rebate is the Payment of ſo much ready money, in lien of a Summe due at any time to come, which put forth at Intereſt, for any ſuch time, would become equal to that Summe ſo due at any time to come.*

A Merchant who is to receive 1680 *l.* at 9 months, deſires preſent payment upon Rebate at 8 *l. per Cent. per annum* Intereſt, from whence ariſeth this queſtion to illuſtrate the Rule, *viz.*

Queſt. 1 How much preſent money is equivalent to 1680 *l.* payable at 9 months Intereſt going at 8 *l. per Cent. per annum*?

If 12 mo. 8 *l.* :: 9 mo. 6 *l.* then
If 106 *l.* 100 :: 1680 *l.* 1584 $\frac{48}{53}$ *l.*
which deducted from 1680, leaves 95 *l.* 1 *s.* 10 *d.* $\frac{1}{2}$ $\frac{30}{53}$ the ſumme to bee rebated.

First this queſtion is by ſome thus reſolved. The firſt er- ronious way.

Viz. If 12 mo. 8 *l.* :: 9 mo. 6 *l.* then
If 100 *l.* 6 :: 1680 *l.* 100 $\frac{4}{5}$ by
which reſolution there accrews 5 *l.* 14 *s.* 1 $\frac{1}{2}$ *d.* loſs.

Secondly, this queſtion is by others reſolved thus. The ſecond.

If 100 *l.* 12 mo. 8 *l.*
1680. 9. 100 $\frac{4}{5}$ the ſame loſs.

Thirdly, others reſolve it thus, The third.

If 108 *l.* 12 mo. 8 *l.*
1680. 9 93 $\frac{1}{3}$ which is 1 *l.* 15 *s.* 2 $\frac{1}{2}$ *d.* loſs

See and exa mine a Que- ſtion of Reb in a ſheet is tuled, Obſ vations upon Intereſt and Rebate, dated 22 *September* 1656, and pr ted 1657, and ſet the queſtion for any number of months under a ye

Fourthly,

The fourth.
This Rule holds
nly for a year,
ut diſtributed
nto months for
eſs time, 'tis
alſe.

Fourthly, others by the following Rule reſolve it after another manner.

The Rule which (for any number of months under 12) is very falſe and injurious, is this, *Double the ſumme given, and divide that Product by 3, then divide that quotient by 3, and the ſecond quotient by 3, and the third quotient is the Rebate for a year*, of which ſumme, ſaith the Author, if it bee for leſs time than a year, you muſt take the aliquot parts of 12 (which begets his errour, and my trouble) *viz.* for 6 months ½, and for 3 months ½ of that, according to the following Operations.

```
  1680
     2
  ----
3|3360
  ----
3|1120
  ----   s.  d.  q.
3|373—6—  8—0
  ----
2/3|124—8—10—2 2/3
  ----
    62—4— 5—1 1/3
    31—2— 2—2 1/6
  ----  ---------
    93—6— 7—3 2/3
```

Which gives the ſame loſs, ⅓ q. onely excepted, as by the operation is manifeſt.

This laſt Rule was lately communicated to mee by my much eſteemed friend Mr. *J. O.* a moſt ingenious Merchant, who (until I rectified his miſtake) did in a very high meaſure magnifie the ſame. Since when I have met with this Rule in the Map of Commerce, a Book of much ingenuity and pains in many parts thereof, where in the 45th. page of the 306th. Chapter the Rebate of 3709 *l.* 12 *s.* 9 *d.* for a year, is found to bee 274 *l.* 15 *s.* 9 *d.*

If the time of Rebate had been 9 months, then by the Rule, the half of —— 274 *l.* 15 *s.* 9 *d.*
for 6 months would bee ———— 137 *l.* 7 *s.* 10 *d.* 2 *q.*
and the half of that for 3 months — 64 — 13 — 11 — 1
In toto —— 206 *l.* 1 *s.* 9 *d.* 3 *q.*

Now to prove the errour, ſay,

mo. *l.* mo. *l.*
If 12 — 8 :: 9 — 6 Then
l. *l.* *l.* *s.* *d.* *l.* *s.* *d.* *q.*
If 106 — 100 :: 3709 . 12 . 9 . 3499 . 13 . 1 . 3

The ſumme to bee paid which deducted from 3709 *l.* 12 *s.* 9 *d.* leaves 209 — 19 — 7 — 0 37/53 *q.* to be rebated.

	l.	*s.*	*d.*	*q.*
Principal ————	3709	12	9	0
Monies payable upon Rebate ——	3499	13	1	3 37/53
Monies rebated by my Rule ——	0209	19	7	0 16/53
Monies rebated by his Rule ——	0206	01	9	3 —
Loſs or Difference by his Rule ———	3	17	9	1 16/53

If Rebatement had been made upon the ſame ſumme at the ſame rate of Intereſt, but for 6 months, the loſs by relying upon this

Rule had been greater, *viz.*

5 *l.* 05 *s.* 8 *d.* $1\frac{1}{113}$ *q.* for 3 mo. 4 *l.* 0 *s.* 9 *d.* $3\frac{5}{17}$ *q.*

When the Rate of Intereſt is 6 *l. per Cent. per annum.*

Queſt. 2 How much preſent money is equivalent to 400*l.* payable at 4 ſix months, *viz.*

l.
100 at 6 mo.
100 at 12 mo.
100 at 18 mo.
100 at 24 mo.

---

mo. *l.* mo. *l.*
If 12 — 6 :: 6 — 3
12 — 6 :: 12 — 6
12 — 6 :: 18 — 9
12 — 6 :: 24 — 12

Then

l. *l.*
103 — 100 :: 100 — $97\frac{9}{103}$ *l.*
106 — 100 :: 100 — $94\frac{18}{53}$
109 — 100 :: 100 — $91\frac{81}{109}$
112 — 100 :: 100 — $89\frac{2}{7}$

Anſwer 372 *l.* 7 *s.* 7 *d.* $1\frac{3024075}{4165217}$ *q.*

Gulſon. The laſt Obſervation in the printed ſheet mentioned in the Margent of one of the pages of this Chapter, is for reducing of ſeveral times of payment to one intire time, wherein ſaith the Author, 4 ſix months equated, the true time of rebate is 15 months, but hee tells you hee cannot give the reaſon thereof, and therefore hee adds another, (which as hee ſaith) is according to Rule and Reaſon (and the ſame.)

His *Queſtion* is the ſame laſt propounded, and his Anſwer 15 months, as before, which will bee proved erronious, both by the former and following Operations.

mo. l. mo.
Viz. If 12 —— 6 :: 15 —— $7\frac{1}{2}$ l. then

l. s. d. q.
If $107\frac{1}{2}$. 100 :: 400. 372. 1. 10. 1 [illegible]
which is 0 l. 5 s. 9 d. 0 [illegible] q. loſs.

Another Author in the 70 page of his book printed 1647, entituled, The uſe of the Tables for Rebatements commits the like errour, *viz.* *Webſter.*

Hee ſuppoſeth the time given to bee four months, that is, ſaith hee, $\frac{1}{4}$ at 4 month $\frac{1}{4}$ at 8 months, $\frac{1}{4}$ at 12 months, and $\frac{1}{4}$ at 16 months, then becauſe the payment is made by 4 parts hee takes $\frac{1}{4}$ part of every time of payment, and the 4 parts ſo taken make 10, which though it may ſeem different from the former Rule, is the ſame, and ſo conſequently alike erronious; *viz.*

The times of payment in the former queſtion are 6, 12, 18, and 24.

$\frac{1}{4}$ of 6 is $1\frac{1}{2}$
$\frac{1}{4}$ of 12 is 3
$\frac{1}{4}$ of 18 is $4\frac{1}{2}$
$\frac{1}{4}$ of 24 is 6

Webſter.

In all 15 months, which is the ſame with the former; And the like Errour hee delivers (in another Rule ſeemingly different from this) in the 188 page of his book printed 1634.

The Author alſo of the former ſheet will find his other way of working (for which hee ſaith, hee can give no reaſon) as true as the reſt, that is falſe, which being as much uſed amongſt Merchants as any of the former that are erroneous, it is not amiſs to confute the one by the other.

The Rule.

Record, Johnſon, Baker, Maſterſon, Hunt, Webſter, Barton, &c.

Becauſe the time is 4 ſix months, they multiply into 6, which produceth 24, then there being times 4 in 24, they adde 6 to 24, to make 30, and take 15 the half thereof for the true time of Rebate, which is only an old errour in a new dreſs, and in theſe Rules above 20 ſeveral writers lye gravelled, though ſome of them, 'tis ſaid, have been printed for Authentick, as often as the Practice of Piety.

Baker.

In another Author printed 1612. chap. 9. pag. 137 is the queſtion, *viz.*

A Merchant ſold Wines for 300 *l.* and

gained after 10 *l.* upon the 100 *l.* the queſtion is, to know how much hee gained in all, for reſolution of which queſtion hee gives this Rule.

If 110 *l* gain 10 *l.* what will 300 *l.* gain, and the Anſwer is 27 $\frac{3}{11}$ *l.* which is erronious, for it is 100 *l.* gaineth 10 *l.* not 110 *l.* and the Queſtion ought to ſtand thus.

100 *l.* 10 *l.* :: 300 *l.* 30 *l.* So the Anſwer will be found 30 *l.* and not 27 $\frac{3}{11}$ *l.*

Another Author printed 1646, page 170 *Johnſon.* hath this queſtion, *viz.* A Merchant received for principal and gain 328 *l.* and found hee had gained clear 56 *l.* what did hee gain upon the 100 *l.* and the Anſwer is 17 $\frac{3}{41}$ *l.*

His Rule thus.

328 *l.* 56 *l.* :: 100 *l.* 17 $\frac{3}{41}$ *l.* which is erronious, for 56 *l.* the gains ſhould be firſt ſubſtracted from 328 *l.* the principal, and then the terms given, and the terms ſought rank thus,

Viz. If 272 *l.* 56 *l.* :: 328 *l.* 20 $\frac{10}{17}$ *l.* So the Anſwer is found 20 $\frac{10}{17}$, not 17 $\frac{3}{41}$.

Another Author printed 1640, Chap. 4. *Record.* pag. 483, hath this Queſtion and Anſwer, *viz.*

A Merchant hath bought *Holland* Cloath at 8 *s.* 6 *d.* *per* Ell, which proveth not to his Expectation, whereupon hee is content to loſe

2 *l.* 3 $\frac{11}{23}$ *s.* in 20 *l.* laying out, the queſtion is, What price ought to be made of the Cloath abating this loſs?

His Rule thus,

Add 2 *l.* 3 $\frac{11}{23}$ *s.* to 20 *l.* and ſay by the Rule of Three,

If 22 *l.* 3 $\frac{11}{23}$ *s.* give but 20 *l.* what ſhall come of 8 *s.* 6 *d.*? work and you ſhall finde 7 *s.* 8 *d.* the juſt price that the Ell ought to be ſold for, after the rate of this loſs, which is erronious, for 2 *l.* 3 $\frac{11}{23}$ *s.* ſhould firſt bee ſubſtracted from 20 *l* which done, there reſts 17 *l.* 16 $\frac{12}{23}$ *s.* and then the terms given, and the term ſought will rank thus,

Viz. 20 *l.* 17 *l.* 16 $\frac{12}{23}$ *s.* :: 8 *s.* 6 *d.* 7 *s.* 6 *d.* 3 *q* $\frac{25}{46}$

So the Anſwer is found 7 *s.* 6 *d.* 3 $\frac{25}{46}$ *q.* not 7 *s.* 8 *d.*

Baker. The Author printed 1612 chap. 4. page 126, hath this Queſtion and Anſwer, *viz.*

If a yard of Cloath of Tiſſue bee ſold for 3 *l.* 15 *s.* whereupon is loſt after the rate of 10 in the 100, I demand what 12 $\frac{1}{2}$ yards of the ſame Tiſſue did coſt?

His Rule this,

Adde unto 3 *l.* 15 *s.* his own $\frac{1}{10}$ part, which is 7 *s.* 6 *d.* and all amounteth to 4 *l.* 2 *s.* 6 *d.* then look what the 12 $\frac{1}{2}$ yards will amount unto, after 4 *l.* 2 *s.* 6 *d.* and you ſhall finde they will come to 51 *l.* 11 *s.* 3 *d.* So much did the 12 $\frac{1}{2}$ yards coſt, which is erronious, For

$$\begin{array}{lllllll} & l. & & & l. & & & l. & & & l. \\ \text{If } \frac{15}{4} & \text{——} & \frac{27}{8} & :: & \frac{100}{1} & \text{——} & 90 \end{array}$$

$$90 \text{——} 100 :: \frac{15}{4} \text{——} 4\frac{1}{6}$$

$$\begin{array}{llllll} & l. & & & & l. \\ \frac{1}{1}\text{ yard.} & 4\frac{1}{6} & :: & 12\frac{1}{2}\text{ yards.} & \frac{625}{12} \end{array}$$

Then if 90 *l.* bee the remainder of 100 *l.* of what is 3 *l.* 15 *s.* the remainder?

$$\begin{array}{lllll} & & l. & s. & d. \\ \frac{15}{4} & \text{is} & 3 \text{—} & 15 \text{—} & 0 \\ \frac{27}{8} & \text{is} & 3 \text{—} & 7 \text{—} & 6 \\ \frac{625}{12} & \text{is} & 52 \text{—} & 1 \text{—} & 8 \end{array}$$

So every yard coſt 4 *l.* 3 *s.* 4 *d.* and not 4 *l.* 2 *s.* 6 *d.* and the 12 $\frac{1}{2}$ yards coſt 52 *l.* 1 *s.* 8 *d.* and not 51 *l.* 11 *s.* 3 *d.*

By theſe confutations the Learner may apprehend how ſeveral Authors take Rules and Queſtions upon truſt from one another, and conſequently how hee may be intricated, perplexed and injured by ignorance, or deſign, eſpecially if a due regard bee wanting to the Rules, Precepts and Principles of Art, which ought alwaies to bee true, certain, and infallible.

CHAP. 19.

Of Partnerſhip or Fellowſhip.

1

FEllowſhip which is ſo called, when a Bank or Stock of mony is made by the reſpective ſtocks of divers men put together, teacheth how to diſcover the profit or diſprofit of every particular perſon, when the gain or loſs of the Adventure is propounded.

2 *The Rule may bee divided into three parts; Fellowſhip without time, fellowſhip with equal time, and Fellowſhip with unequal time.*

3 *Fellowſhip without time is when ſhots and ſhares are divided, or the Stocks imployed upon an immediate contract, or the like, without limitation, or reſpect of time.*

4 *Fellowſhip with equal time, when the Stocks are imployed for times or daies limited by the Partners or Adventurers. And*

5 *Fellowſhip with unequal time, when one or more of the Partners or Adventurers ſtocks are continued for a ſhorter or longer time than the reſt.*

6 *Fellowſhip without time, and with equal time is called the ſingle Rule of Fellowſhip, and Fellowſhip with unequal time, the Double Rule of Fellowſhip.*

Two

Fellowſhip without time.

Two Merchants buy 100 Bags of Indico, which coſt 500 *l.* towards which

A. payes — 200 *l.* } By ſale thereof
B. payes — 300 } they gain or loſe
——— } 160 *l.* what are their
500 } reſpective gains or loſſes?

Anſwer A. gains or loſes — 64
B. gains or loſes — 96

As the total Stock to the general gain or loſs, ſo each mans particular Adventure to his gain or loſs; Therefore 500 the total Stock is the firſt Number in the Golden Rule, 160 the loſs or gain, the ſecond. The different Stocks or Adventures the third, that is 200 is the third number in the firſt Operation, and 300 the third in the ſecond operation (there may bee ſo many operations in the Golden Rule, as there are particular Stocks) And each mans gain or loſs the fourth.

l. *l.*
Viz. If 500—160 : : 200—64
If 500—160 : : 300—96
———
160 proof.

The firſt mans gains or loſſe ſubſtracted from the total gains or loſſe, leaves the gains or loſſe for the ſecond.

Obſerv. 1. Or when you have found *A.* his gain or loſs by the firſt operation to bee 64, you may ſpare the trouble of uſing the Golden

Rule the ſecond time, for by ſubſtracting *A.* his 64 *l.* from 160 the total gain or loſs, you will finde 96 to remain for the gains or loſs of *B.*

Proof. If the total of the reſpective gains or loſs, equal the total gain or loſs, the work is perfect, as in the Example beforegoing.

Viz. $64 + 96 = 160$

llowſhip with
qual time.

A. and *B.* enter Partnerſhip for three years,

A. put in — 850
B. put in — 1120
Total — 1970

They gained 620 at the end of the Term, what are the reſpective proportions?

l. *l.* *l.*
If 1970 — 620 :: 850 — $267\frac{101}{197}$ *l.*
If 1970 — 620 :: 1120 — $352\frac{96}{197}$

620 proof.

Four Merchants put Money to Stock.

l.
A. 100 for 3 months
B. 200 for 4 months
C. 400 for 6 months
D. 500 for 8 months

They gain 1000 *l.* what are their reſpective proportions?

ellowſhip with
nequal time.

In this Rule, which is called the Double Rule of Fellowſhip,

1 The total of the Stocks multiplied by the time they are continued out, is the firſt number in the Golden Rule.

2 The loſs or gain the ſecond.
3 The particular Stocks multiplied by their time the third, And
4 Each mans gain or loſs the fourth.

A. 100 x 3 = 300
B. 200 x 4 = 800
C. 400 x 6 = 2400
D. 500 x 8 = 4000

7500 Then

l. *l.* *l.* *l.*
If 7500 — 1000 :: 0300 — 040
If 7500 — 1000 :: 0800 — 106 $\frac{2}{3}$
If 7500 — 1000 :: 2400 — 320
If 7500 — 1000 :: 4000 — 533 $\frac{1}{3}$

1000 proof.

Obſerv. 2. When you have found A. *B.* and *C.* to gain 40. 106 $\frac{2}{3}$ and 320 *l.* ſubſtract 466 $\frac{2}{3}$ the total of thoſe ſummes from 1000, and there reſts 533 $\frac{1}{3}$ for the ſhare of *D.* from which, and the firſt Obſervation you may learn, that where there are onely two Partners or Adventurers, you may uſe the Golden Rule but once, when Three but twice, and when Four but thrice, &c. for though there may bee as many operations as there are particular Stocks (by the 7th. Rule) yet there need not bee ſo many by one, Or *viz.*

Obſerv. 3. When in the firſt operation in the precedent queſtion you have found 300 *l.* to gain 40 *l.* then without any further application to the Golden Rule, 2400 in the third queſtion containing 300 eight times, muſt infallibly gain 8 times 40, which is 320. Again, 800 in the ſecond operation gaining 106 $\frac{2}{3}$. 4000 in the fourth operation containing 800 five times, will gain 5 times 106 $\frac{2}{3}$, which is 533 $\frac{1}{3}$, and many other ſuch like notable Compendiums and Abridgements may bee diſcovered by being converſant with the Rules.

Obſerv. 4. Divers Queſtions impoſſible to bee anſwered may bee propounded, as when the Partners want of the due ſhares appointed by the Queſtion; or the parts exceed the total: Inſtances whereof might bee abundantly given out of the impoſſibilities propoſed by Antient Authors; but I ſhall onely inſiſt upon the 2 Queſtions following, to ſhew the Learner, that ſomething of pleaſure or profit may bee ſometimes had even out of abſurdities.

A Teſtator bequeathes 600 *l.* in Legacies to A. *B.* *C.* *D.* *Viz.* to A. $\frac{1}{4}$, to *B.* $\frac{1}{6}$ to *C.* $\frac{1}{8}$, and to *D.* $\frac{1}{12}$, which amount but to 375 *l.* yet the Executor paying the proportions aſſigned, anſwers that hee hath diſcharged the truſt, whereas the minde of the Teſtator favourably taken, the 600 *l.* ought to bee diſtributed into ſuch proportion as the parts bear one to another, for doubtleſs the Laws will not ſo puniſh the Teſtators ignorance, as to allow the Executor 225 *l.* the Remainder.

	600
4	150
6	100
8	75
12	50
30	375

When the parts are not anſwerable to the whole.

Therefore 4 † 6 † 8 † 12 = 30 Then
If 30—600 :: 4—80—not 150
If 30—600 :: 6—120—not 100
If 30—600 :: 8—160—not 075
If 30—600 :: 12—240—not 050.

600 for proof.

See the third Obſervation in this Chapter.

The ſumme of 15702 *l.* being a Reward given to three perſons, is to bee diſtributed in ſuch ſort, that the firſt may have $\frac{1}{2}$, the ſecond $\frac{1}{3}$, the third $\frac{1}{4}$, which is impoſſible, for the parts make $\frac{1}{12}$ more than the Reward, *viz.*

When the parts exceed the whole.

Admit the Integer a pound ſterling, or 20 *s.*

	s.	*d.*
$\frac{1}{2}$—is—	10	0
$\frac{1}{3}$—is—	6	8
$\frac{1}{4}$—is—	5	0

l.	*s.*	*d.*
1	1	8

To anſwer this Queſtion, and ſuch other of like nature, ſeek a number which you may

ſo divide by all the Denominators of the Fractions, that the Quotients may be whole Numbers: To finde which, multiply the Denominators continually, and they produce 24, of which take 12 the $\frac{1}{2}$ (the leſſer the number you take, the eaſier the operation)
*2.3::4.6 which ∷ 2.3 and 4 gives *6.4 and 3,
3.2::6.4 which make 13 for the firſt Number in the
4.6::2.3 Golden Rule.

The Reward is the ſecond.

[13] The Reſpective Shares the third, &c.

If 13—15702—6—7247 $\frac{1}{13}$
If 13—15702—4—4831 $\frac{5}{13}$
If 13—15702—3—3623 $\frac{7}{13}$

15702 for proof.

CHAP. 20.

Of Alligation Medial.

1

THe Rule of Alligation teacheth how to binde, tye, mix, or unite many Simples or Particulars into one Maſs or Summe, according to any rate, price or proportion required.

2 *Alligation conſiſteth of two Species.* 1 *Medial.* 2 *Alternate.*

3 *When the Quantities and Rates of divers Simples are propounded by Alligation Medial, Wee diſcover the mean rate or common price of*

of a mixture compounded of theſe Simples, viz.

Queſt. 1 When 5 quarters and ½ of Beans 2 *s.* 9 *d. per* Buſhel, 6 *Quarters* and two Buſhels of Peaſe 2 *s. per* Buſhel, and 4 quarters, and two Buſhels of Oats which coſt 34 *s.* are mixt together, what is a Buſhel of the Miſtling worth?

Anſwer 2 *s.*

Reduce the Meaſure and the Money to the leaſt Denomination in the Queſtion, and againſt the quantities ſet down the prices, the ſumme of the meaſure will then bee found 128 Buſhels, and the total of the Money 256 *s.*

	Buſh.	*l.*	*s.*	*d.*
Beans	44	6	01	0
Peaſe	50	5	00	0
Oats	34	1	15	0
	128	12	16 *s.*	0
		256 *s.*		

The Meaſure and the Mony reduced.

4 *Then as* 128 *Buſhels the ſumme of the Quantities to bee mixt to* 256 *s. the price or value of the Simples, So one Buſhel of the mixture to the price thereof.*

B. *s.* B. *s.*
128—256 :: 1—2

Proof.

5 If the work bee right, *the ſumme of the quantity to bee mixt* x *the common price, will bee = the ſumme of the particular prices,* as in this Example, *viz.*

128 x 2 = 256

Queſt. 2 A Draper having four ſeveral ſorts of Linnen-Cloath, is deſired to fix a price how hee will ſell one Ell with another: Now what price ought hee to ſet upon the parcels following, that hee ſell not above the prices ſet down?

Anſwer 3 *s.* 8 $\frac{2}{7}$ *d.*

		l.	s.	d.
1	20 Ells at 3 *s. per* Ell	3	0	0
2	30 Ells at 3 *s.* 4 *d. per* Ell	5	0	0
3	40 Ells at 2. 8	5	6	8
4	50 Ells at 5 the Ell	12	10	0
	140	25	16	8

The total of the prices reduced to groats, gives 1550, then

Ells, Groats Ell

If 140 —— 1550 :: 1 —— 11 $\frac{1}{4}$ Groat, which is 3 *s.* 8 *d.* $\frac{2}{7}$ *d.*

Queſt. 3 A Gold-Smith hath 10 *lb.* of Silver Bullion of 6 ℥ fine, 15 *lb.* of 7 ounces fine, and 25 *lb.* of 8 ℥ fine, of what fineneſs will a *lb.* weight of the Maſs be when they are all melted together?

Anſwer 7 $\frac{3}{10}$ ℥.

$$\begin{array}{lcr} 10 \text{ x } 6 & = & 60 \\ 15 \text{ x } 7 & = & 105 \\ 25 \text{ x } 8 & = & 200 \\ \hline 50 & & 365 \end{array}$$

Then

If

lb. ℥ fine *lb.*
If 50 —— 365 :: 1 —— $7\frac{3}{10}$ ℥ fine

1000
250
2

$50 \times 7\frac{3}{10} = 365$ for proof.

Of Alligation Alternate.

172

6 *When the ſeveral Rates of divers Simples are given by Alligation Alternate, ſuch quantities of them are diſcovered, as are neceſſary to make a mixture, which may bear a certain rate propounded.*

72

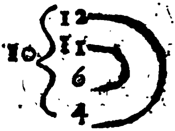
Queſt. 4 How may 120 *lb.* of Wooll of 4 ſorts?

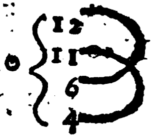
Viz. Blew Wooll at — 12 *s.* } *per* Stone bee ſo
Red Wooll at — 11 } mixt together,
Green Wooll at 06 } that a ſtone of
White Wooll at 04 } the mixture may
bee worth 10 *s.*

7 *Write the rates propounded,* viz. 12—8—6—4 *one above another, then draw a line of connexion, and place* 10 *the given rate of the mixture upon the left hand, as in the Margent.*

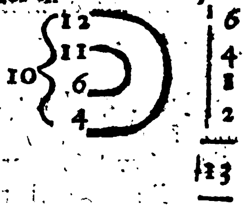
$$10\left\{\begin{array}{l}12\\8\\6\\4\end{array}\right.$$

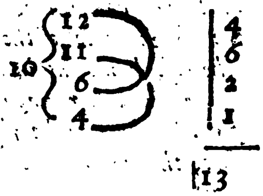
8 *The Termes ranked in their right Order link the Numbers on the right hand together, in ſuch ſort, that one greater then* 10 (*the rate of the mixture*) *may bee alwaies coupled with another leſs than the ſame.*

Thus 

Or thus 

9 *Then finde the Differences betwixt them, and* 10 *(the rate of the mixture) and write the difference of each number juſt againſt the number with which it is linked:* So the Example aforegoing, being linked after the firſt Order, the difference between 12 and 10 being 2, I place againſt 4 the number to which 12 is linked, and the difference between 4 and 10 being 6, I place againſt 12 the number wherewith 4 is linked; In like manner the difference between 11 and 10 being 1, I place againſt 6, and laſtly, the difference between 6 and 10 being 4, I place that againſt 11, and the work will ſtand as in the Margent. But if the numbers bee linked after the other order, the work will be thus diſpoſed, *viz.*





After the firſt order it is evident, that ſo often as you take 6 of Blew, you muſt take 4 of Red, 2 of Green, and 2 of White.

10 *As* 14 *the total of the prices given, and the price propounded* **Proof.**

Is in portion to 112 *the total ſumme or quantity to bee mixt.*

So ſhall 6—4—1—2 *each reſpective difference of the price given, and the price ſet, bee in proportion unto the quantity of each particular ſort to bee mixt*; and repeating the Golden Rule ſo often as there are particular differences, you will produce particular quantities to them, whoſe total muſt bee equal to the ſumme or quantity propounded to bee mixt, as in the following Examples, where 120 the ſumme of the quantities found is equal to the total quantity propounded, *viz.*

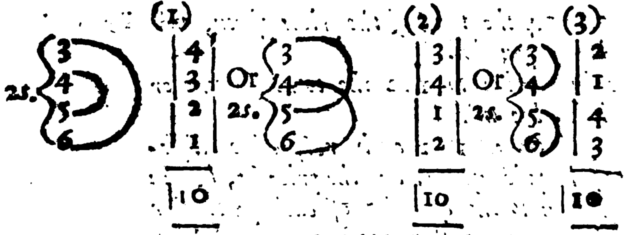
13—120 :: 6—55 $\frac{5}{13}$
13—120 :: 4—36 $\frac{12}{13}$
13—120 :: 1— 9 $\frac{3}{13}$
13—120 :: 2—18 $\frac{6}{13}$

120 proof

Queſt. 5 A Vintner hath divers ſorts of Wine, *viz.* Wine at 3 *s.* Wine at 4 *s.* Wine at 5 *s.* Wine at 6 *s.* how may a mixture bee made containing 100 gallons, to ſell a gallon at 2 *s.*

I

2 *s.*



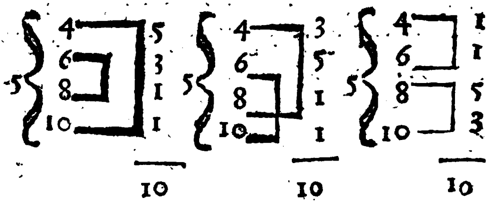
10—100 :: 4—40
10—100 :: 3—30
10—100 :: 2—20
10—100 :: 1—10

100 for proof.

See the ſecond Order of linking in the 9th. Rule. Obſervation 1.

If the Vintner deſire to take more of one ſort than of another, hee may counterchange the prices at pleaſure, as in the queſtion following, and that before-going, for though ſuch counterchanges produce variety of ſolutions, yet they will bee all true.

Queſt. 6 Compound 400 *l.* of Silver Bullion, of 4, 6, 8, and 10 ʒ fine, that it may bee juſt 8 ʒ fine.



10—400 :: 5—200
10—400 :: 3—120
10—400 :: 1—040
10—400 :: 1—040

400 for proof.

Queſt. 7 How much Alloy muſt be mixed with Bullion of 8 ℥ fine, to abaſe the Bullion to 5 ℥ fine?

5 } 8 | 5 } For every 5 ℥ of Silver, I take
Alloy } 0 | 3 } 3 of Alloy.

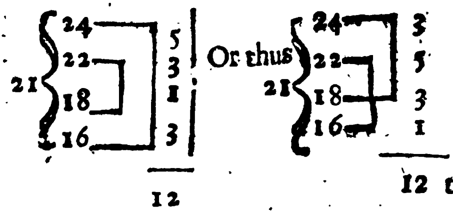
For Alloy it being of no value ſet down—0.

Alloy. Alloy is courſer Silver, or Copper, or ſome other baſer Metal, with which the Gold-ſmiths uſe to mix their Gold or Silver, to the intent they may moderate, or abate the fineneſſe thereof.

Gold. An ounce of Gold is divided into 24 parts, called Carects, and an ℥ of Silver conſiſts of 20 parts, each called a *dw.* Therefore to diſtinguiſh the fineneſs of Metals, ſuch Gold as will endure the trial of fire, and not diminiſh in its weight, is ſaid to bee 24 Carects fine, if it loſe 2 Carects in trial, it is ſaid to bee 22 Carects fine, &c.

Silver. Silver is valued in ℥. as Gold is in Carects; And as a Pound of Silver which loſeth nothing in trial is ſaid to bee 12 ℥ fine; ſo if it loſe 2 *dw.* in trial, it is ſaid to bee 11 ℥ 18 *dw.* fine &c.

Queſt. 8 A Gold-ſmith having divers ſorts of Gold, *viz.* ſome of 24 Carects, other of 22 Carects, ſome of 18, other ſome of 16 Carects fine, is deſirous to melt of all theſe ſorts ſo much together, as may make a Maſs containing 60 ounces of 21 Carects fine.



then

12—60 :: 5—25
12—60 :: 3—15
12—60 :: 1—05
12—60 :: 3—15

60

Queſt. 9 A Mint-Maſter hath 80 *lb.* weight of Gold, of 21 Carects fine, and 50 *lb.* weight of 20 Carects fine, whether ought any Alloy to bee mixed with it or not? and if any, how much to make a pound of the mixture 18 Carects fine?

1 By Alligation Medial, diſcover what fineneſs a pound of this Maſs will bear when both ſorts are mixed together? *viz.*

$$\begin{array}{r}8 + 50 = 130\\ 80 \times 22 = 1760\\ 50 \times 20 = 1000\\ \hline 2760\end{array}$$ then

If 130 — 2760 :: 1 — 21 $\frac{3}{13}$ Carects fine, whence 'tis evident Alloy muſt bee mixed to abate it from 21 $\frac{3}{13}$ to 18, then

By Alligation Alternate

$$18\begin{cases}21\frac{3}{13}\\ 0\end{cases}\begin{array}{|l}18\\ 2\frac{10}{13}\end{array}$$ Now the Exceſs declares, that for every 18 *lb.* weight of Gold, hee muſt take 2 $\frac{10}{13}$ Alloy. Then

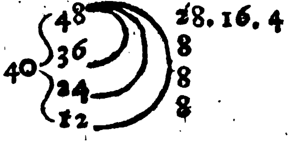
If 18—2 $\frac{10}{13}$ :: 130—20, which ſhews hee muſt mix 20 *lb.* Alloy with 130 *lb.* of Gold, to make a *lb.* of the Maſs 18 Carects fine.

Queſt. 10 If 10 Gallons of Canary at 4 *s.* *per* Gallon, were to bee mixed with Mallago at 3 *s.* Rheniſh Wine at 2 *s.* and White Wine at 12 *d.* *per* Gallon, how much of each ſort muſt bee taken to make the mixture to ſell at 3 *s.* 4 *d.* *per* Gallon, which is 40 *d*?

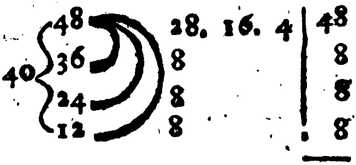
The prices reduced to pence the loweſt Denomination in the Queſtion, the terms in their right order rank thus,

$$40\begin{cases}48\\ 36\\ 24\\ 12\end{cases}$$ Then the difference between 40 and 48 being 8, ought to bee thrice

thrice tranſcribed, *viz.* firſt againſt 12, then againſt 24, and laſt againſt 36 and 28 the difference between 40 and 12, and 16 the difference between 24 and 40, and 4 the difference between 36 and 40, ought all to bee placed againſt 48, then



11 *When in one and the ſame line there are found more differences than one, add them together, and write the ſumme juſt againſt the ſame differences in a ſtraight line drawn towards the right hand of the work, as in the Margent.*



12 (1) *Then as* 48 *the ſumme of the differences annexed to the rate of the Canary to* 8 *the difference annexed to the rate of the Mallago, So is* 10 *the given quantity of the Canary to* $1\frac{2}{3}$ *the required quantity of Mallago.*

(2) *As* 48 *to* 8, *ſo is* 10 *to* $1\frac{2}{3}$ *the requiſite quantity of the Rheniſh Wine.*

(3) *As* 48 *to* 8, *ſo is* 10 *to the quantity of White Wine required in the mixture,* viz.

48—8 :: 10—$1\frac{2}{3}$ Mallago
48—8 :: 10—$1\frac{2}{3}$ Rheniſh
48—8 :: 10—$1\frac{2}{3}$ White Wine.

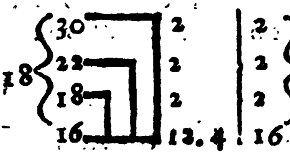
5

If the total value of the ſeveral ſimples agree with the value of the whole mixture, the work is right, *viz.*

	s.	*l.*	*s.*	*d.*
10 Gallons of Canary at	4	02	00	0
1 2/3 of Mallago at	3	00	05	0
1 2/3 of Rheniſh at	2	00	03	4
1 2/3 of White Wine at	1	00	01	8
		02	10	0

Which is equal to the whole mixture of 15 Gallons, at 3 *s.* 4 *d. per* Gallon.

Queſt. 11 How many Buſhels of Rye at 22 *d.* Barley at 18 *d.* and Oats at 16 *d. per* Buſhel, muſt I commix with 10 Buſhels of Wheat at 30 *d. per* Buſhel, to make a Buſhel of the mixture worth 18 *d.*



If 2 *qr.* Wheat give two of Rye, what 10, &c? And

22

The Anſwer will bee found 10 Buſhels of Rye, 10 of Barley, and 80 of Oats, to every 10 Buſhels of Wheat.

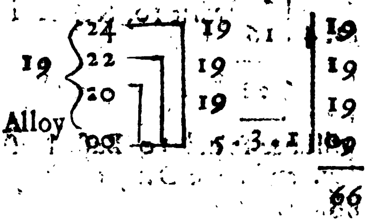
Obſerv. 2. By ſome of the former Examples diverſified, it is apparent that the quantities required may bee altered as often as the que-

ſtion

tion will admit of divers Alligations, and yet the mixture produced will ſtill hold the rate propounded. I could here ſhew the Learner variety of Counterchanges and Combinations, but they would rather perplex than perfect him. All thoſe therefore that are abſolutely neceſſary being inſerted, the reſt are omitted.

Obſerv. 3. Such as the following and the foregoing Examples will admit but one onely way of Alligation, and therefore the quantities required to make the mixture cannot be varied.

Queſt. 12. A Gold-ſmith hath Gold of 24 Carects, other of 22, and other ſome of 20 Carects fine, which hee would ſo mix with Alloy, that 80 ounces of the mixture might bear 19 ounces fine; The queſtion is, How much of each ſort hee muſt take to accompliſh his deſire?



1	66—80 :: 19—23 $\frac{1}{33}$	24 Carects	fine.
2	66—80 :: 19—23 $\frac{1}{33}$	22 Carects	
3	66—80 :: 19—23 $\frac{1}{33}$	20 Carects	
4	66—80 :: 09—10 $\frac{30}{33}$	Alloy.	

80 the ſumme of the quantities found, which agrees with the total quantity propounded.

CHAP. 21.

Of Exchange, and Reduction of Coins; Weights, Meaſures, &c.

The Merchants Jewel.

IN a Book printed 1628, are Tables for Reduction of Coins, Weights, Meaſures, &c. Reſolving, ſaith the Author, with ſpeed and pleaſing facility, *above ten hundred thouſand Queſtions* (not a million). And in his Epiſtle *To the Right Honourable, the Right Worſhipful Companies of Merchants, &c.* Hee ſaith, (maturity of years producing expertneſs only, no perfection) hee is emboldened to perſwade them to a deliberate reading, and circumſpect uſing of the work.

That if not much knowledge, yet certainly much eaſe (eaſe without knowledge) would bee gained thereby.

The Handmaid to Arithmetick.

The Title page to another Tract printed 1633 (with thoſe and other Tables) tells you, that that Book abounds with above 150 Tables for Monies, Meaſures, Weights, &c.

he Map of ommerce.

In another printed 1638 (which abounds too) are the Tables in the Tracts above-mentioned, reprinted with others, but in chap. 272 pag. 246, the Author ſaith, how true his Obſervations are, hee muſt refer to trial upon experience. That hee had inſerted Mr. *Hunts* Table of Reſpondency of other Countries, &c. and pag. 247 of the ſaid chap. hee referrs the truth of the Tables to the Inquiſition of the Curious.

Maſterſon, ohnſon, Hills, cybourn, &c.

Many others who before and ſince have printed thoſe and the like Tables, ſay, they are collected from thoſe who they *think* have gone *neereſt* the Truth.

ingate 262.

That hee would not have any to confide in them further than they ſhall know them to bee agreeable to Truth, &c.

ecord, Baker, &c.

Others take them upon truſt, and print them without any Caution, which to mee is an Argument that they have ſhut the eye of Reaſon, to open the eye of Faith, and ſo beleeve more than their ſhare, and underſtand leſs.

I confeſs, that ſuch as are converſant with Trade, and by much practice in Exchanges, know what proportions the Coins, Weights and Meaſures of one Country, or City, do bear unto thoſe of another, may by the following method, or the Rule of Three, frame Tables for their own uſe, to expedite their affairs: But the Tables that I generally meet with, being taken upon truſt, and (as 'tis feared) printed more for noiſe than neceſſity,

I

(I have not met with one Merchant that ever mentioned any Advantage hee received thereby, in order to his Buſineſs) I know not to what purpoſe I ſhould inſert them, and therefore they are omitted.

And I cannot but tell the Reader, that it takes up a little of my Admiration to finde the Author of the Handmaid of Arithmetick, (a Mr. of Arts) in his Epiſtle to the Reader, to advertiſe, that queſtions of Rebate are not ſo exactly wrought by Rule, as by the Tables of *Valentine Menhire* a *Dutch-man*, and another Table in *Botelers* Almanack. A ſad miſtake, and certainly inſerted to no other purpoſe, than to prefer the ſale of thoſe Tables, &c.

See the 18th. Chapter of Rebate for confutation of this aſſertion or Advertiſement.

Obſervation upon forein Meaſures.

The *French* Auln cont. 24	nails	6 times 4 in 24
The *Engliſh* Ell cont. 20		5 times 4 in 20

The *Flemmiſh* Ell 12	nails	3 times 4 in 12
The *Engliſh*——20		5 times 4 in 20

Therefore *French* Aulns to *Engliſh* Ells multiply by 6, divide by 5, and *e contra*, *Engliſh* Ells to *French* Aulns, multiply by 5, divide by 6.

Flemmiſh Ells to *Engliſh*, multiply by 3, divide by 5.

Engliſh Ells to *Flemmiſh*, multiply by 5, divide by 3, &c.

See Reduction of Meaſures, Chap. 6. and the obſervation upon the Table of Silk and Venice-weight in the 15th. Rule of the 14th. Chapter.

In 600 *French* Aulns, how many *Engliſh* Ells ——— 600 *Fr.* Aulns

See the 3d. and 4th. Queſtion of the 6th. Chapter in Reduction of Meaſure.

6

5 | 3600

720 Ells Engliſh.

5

6 | 3600

600 Fr. Aulns.

In 600 Flemmiſh, how many Engliſh?

600 Flemmiſh Ells

3

5 | 1800

360 Ells Engliſh

5

3 | 1800

600 Ells Flemmiſh

Forein Coines.

It is obſerved, that 7 *l.* Flemmiſh are but 6 *l.* Engliſh, 7 *s.* Flemmiſh are but 6 *s.* Engliſh, and 7 *d.* but 6 *d.* then

Flemmiſh *l. s.* or *d.* x 6 and ÷ 7 are *l. s.* and *d.* Engliſh, and *è contra.* If ſo, then

Engliſh *l. s.* or *d.* x 7 and ÷ 6 are *l. s. d.* Flemmiſh.

Example.

Example.

How much ſterling *l.* *s.* *d.* or Engliſh Money is 233—13—4 Flemmiſh

6

7|1402—00—0

200—05—8 $\frac{4}{7}$ Engliſh

6|1402—00—0

233—13—4 Flem.

Or thus,

7|233—13—4 Flem.

33— 7—7 $\frac{3}{7}$

6|200— 7—8 $\frac{4}{7}$ Engliſh

3— 35—7 $\frac{3}{7}$

233—13—4 Flemmiſh

6 *l.* ſterling making 7 *l.* Flemmiſh, divide the Flemmiſh mony by 7, and the Quotient ſubſtracted from the ſum given, will bee Engliſh money. If the ſumme given be Engliſh money, divide it by 6, and the quotient added to the ſumme given will bee Flemmiſh money.

Flemmiſh and Engliſh monies

See the 17th. Rule of the 5th. Chapter.

A like method may be contrived for any other Coins, Weights, Meaſures, &c. When the Species may bee abbreviated or parted, as before, but if they cannot bee advantagiouſly or conveniently parted by reaſon of their fractional parts, &c. then recourſe muſt bee had to the Golden Rules, Practice or Reduction, as will

See the obſervation upon the Table of Silk and Venice-weight in the 15th. Rule in the 14th. Chap.

will bee evident by ſome of the following Queſtions.

By the Rule of Three, Or 1200 x 3 and I 4 = 900.

Queſt. 1 When 15 *s.* ſterling make 1 *l.* Iriſh, how many *l.* ſterling muſt be exchanged for 1200 Iriſh?

Anſwer 900 *l.* ſterling.

By the Rule of Three, Or 900 x 4 and I 3 = 1200.

Queſt. 2 In 900 *l.* ſterling, how many *l.* Iriſh? 20 *s.* Iriſh making 15 *s.* ſterling.

Anſwer 1200 *l.* Iriſh.

By the Rule of Three, Or 2000 I 20 = 100.

Queſt. 3 When 1 *l.* ſterling is equivalent to 20 Scottiſh Marks, how many *l.* ſterling muſt bee given in exchange for 2000 Scotch Marks?

Anſwer 100 *l.*

By the Rule of Three, Or 2000 I 100 = 20.

Queſt. 4 If I pay 100 *l.* ſterling for 2000 Scotch Marks, how many Scotch Marks make 20 *s.* ſterling?

Anſwer 20 Scotch Marks.

By the Rule of Three, Or 470 I $\frac{3}{10}$ = 1566 $\frac{2}{3}$.

Queſt. 5 How many French Crowns at 6 *s. per* peece, are to bee exchanged for 470 *l.* ſterling?

Anſwer 1566 $\frac{2}{3}$ French Crowns.

By Reduction. See the 7th. and 8th. Queſtions of the 13th. Chap. Or 1566 $\frac{2}{3}$ x $\frac{3}{10}$ = 470.

Queſt. 6 In 1566 $\frac{2}{3}$ French Crowns at 6 *s. per* Crown, how many *l.* ſterling at 20 *s*?

Anſwer 470 *l.*

Queſt. 7 In 920 *l.* ſterling, how many ucats at 12 *s.* 8 *d*?

Anſwer 1452 $\frac{12}{19}$ Ducats.

By the Rule of Three, Or 55200 ⌶ 38 = 1452 $\frac{12}{19}$

Queſt. 8 In 1452 $\frac{12}{19}$ Ducats, at 12 *s.* 8 *d.* w many *l.* ſterling at 20 *s*?

Anſwer 920 *l.* ſterling.

By Reduction, Or the Rule of Three.

Queſt. 9 In 960 *l.* ſterling, how many iſtolets at 7 *s.* 6 *d*?

Anſwer 2560 Piſtolets.

By the Rule of Three, Or 960 ⌶ $\frac{3}{8}$ = 2560.

Queſt. 10 What 2560 Piſtolets 7 *s.* 6 *d*?

Anſwer 960 *l.*

Or thus,

$$\begin{array}{r|r} \frac{4}{2} & 2560 \\ \hline & 640 \\ & 320 \\ \hline & 960\ l. \end{array}$$

By Practice, Or 2560 x by $\frac{3}{8}$ = 960.

Queſt. 11 In 780 *l.* ſterling, how any Dollers at 5 *s.* 6 *d*?

Anſwer 2836 $\frac{4}{11}$ Dollers.

By the Rule of Three, Or 780 reduced to Teſters, and ⌶ 11 = 2836 $\frac{4}{11}$ Dollers.

Queſt. 12 In 2836 $\frac{4}{11}$ Dollers at 5 *s.* 6 *d.* w many *l.* ſterling at 20 *s*?

Anſwer 780 *l.*

By Reduction, Or 2836 $\frac{4}{11}$ reduced, and ⌶ 40 = 780 l.

Queſt. 13 When 200 *l.* ſterling is delired at *London* by Exchange for *Antwerp* at 3 *s.* 5 *d.* Flemmiſh the pound ſterling, how uch Flemmiſh muſt bee received at *Antrp*?

For

s. d.
For 3—4 ⌶ 6 | 200
d. | 33—6—8
Then in 200 ———— 16—8

Anſwer 234—03—4 Flemmiſh.

Queſt. 14 When a Bill of Exchange is ac- cepted at *London* from *Antwerp* of 300 *l.* ſter- ling for the value delivered there at 22 *s.* 8 *d.* Flemmiſh for a pound ſterling, how much Flemmiſh money was delived at *Antwerp*?

s.
For 2 ⌶ 10 | 300
d. | 30
For 8. 30 ⌶ 3 | 10

Anſwer 340 Flemmiſh.

Queſt. 15 A Merchant at *London* accep a Bill of Exchange from *Antwerp* of 300 ſterling for 356 *l.* Flemmiſh paid there; th queſtion is, at what rate the Exchange went Anſwer at 23 *s.* 8 *d.* $\frac{4}{5}$ Flemmiſh for pound ſterling. For

l. l. l. s.
If 300—356 :: 1—23—8 $\frac{4}{5}$ *d.*

Queſt. 16 A Bill of Exchange is accepted at *Antwerp* for payment of 100 *l.* Flemmiſ for 87 *l.* ſterling delivered at *London*, th *Queſtion* is, at what Rate the pound ſterlin was delivered?

Anſwer at 22 *s.* 11 $\frac{25}{29}$ *d.* For

l. *l.* *l.* *s.*
If 87——100 :: 1——23——11 $\frac{25}{29}$ *d.*

Queſt. 17 If the Exchange from *Antwerp* to *London* go at 23 *s.* 2 *d.* Flemmiſh for a *l.* ſterling, how much money muſt I pay at *Antwerp*, to receive 143 *l.* 17 *s.* 8 *d.* at *London*?

Anſwer—166 *l.* 13 *s.* 3 *d.* &c.

	l.	*s.*	*d.*	
	143	17	8	
For 2 *s.* $\frac{1}{10}$	14	07	9	&c.
For 1 $\frac{1}{2}$ of that	7	03	10	&c.
For 2 *d.* $\frac{1}{6}$ of that	1	03	11	&c.
Anſwer	166	13	03	&c.

Queſt. 18 A Merchant at *Antwerp* received a Bill of Exchange from *London* of 368 *l.* Flemmiſh for the value delivered there at 23 *s.* 3 *d.* Flemmiſh the pound ſterling, how much ſterling money was delivered at *London*?

s. *d.*
23—3 368
4 80

93 threepences. 29440 threepences, which divided by 93, gives for Anſwer 316 *l.* 11 *s.* 2 *d.* $\frac{6}{31}$ *d.* the monies paid at *London.*

Many pleaſant and profitable Advantages

may bee made from the ſeveral operations of the queſtions before-going (and likewiſe from the laſt queſtion in the 15th. Chapter, which is performed 5 ſeveral waies) all the other varieties requiſite in Exchanges, are to bee ſeen in the 8th. 9th. 10th. and 11th. queſtions of the 17th. Chapter.

Of Weight.

Queſt. 1 If 100*lb.* at *Hamborough* be 106 *lb.* at *London*, and 104 *lb.* at *London* 100 *lb.* at *Antwerp*, how many *lb.* of *Antwerp* make 100 *lb.* at *Hamborough* ?

Anſwer 101 $\frac{12}{13}$ of *Antwerp.*

Ham. *Lon.* *Lon.* *Ant.* *Ham.* *Ant.*

100—106—104—100—100—101 $\frac{12}{13}$ by the 11th. Rule of the 17th. Chapter.

Queſt. 2 If 56 *lb.* at *London* be 49 *lb.* at *Rovan*, and 50 *lb.* at *Rovan* be 56 at *Sivil*, how many pounds at *Sivil* make 56 *lb.* at *London*?

Anſwer 54 *lb.* $\frac{154}{176}$ of *Sivil.*

Lon. *R.* *R.* *S.* *Lond.*

56—49—50—56—56—54 $\frac{154}{175}$ by the ſame Rule and Chapter.

Queſt. 3 If 26 *lb.* Engliſh make 25 *lb.* Flemmiſh, and 25 *lb.* Flemmiſh 29 *lb.* at *Rochel*,

Rochel, how much Engliſh-weight in 100 *lb.* at *Rochel*?

Anſwer 89 $\frac{19}{29}$ Engliſh.

Eng. Flem. Fl. Roch. Roch. Eng.
26—25—25—29—100—89—$\frac{19}{29}$ by the 12th. Rule of the 17th. Chapter.

Queſt. 4 If 26 *lb.* Engliſh make 25 *lb.* Flemmiſh, and 25 *lb.* Flemmiſh bee 29 *lb.* at *Rochel*, in 112 *lb.* Engliſh how many *lb.* of *Rochel*?

Anſwer 124 $\frac{13}{12}$ *Rochel.*

Queſt. 5 If 1037 *lb.* at *London* be 1000 *lb.* at *Antwerp*, and 100 at *Antwerp* 108 at *Bruges*, and 80 at *Bruges* 100 at *Barcelonia*, how many pounds of *Barcelonia* make 112 *lb.* at *London*?

By the 13th. Rule of the 17th. Chapter, the Anſwer will bee found 145 $\frac{835}{1037}$ *l.* of *Barcelonia*, viz.

Lon. Ant. Ant. Bru. Bru. Bar. Lon. Bar.
1037—1000—100—108—80—100—112—145 $\frac{835}{1037}$ *lb.*

Queſt. 6 If 259 *lb.* at *London* bee 231 *lb.* at *Noremberge*, and 926 *lb.* at *Noremberge* 980 *lb.* at *Venice*, and 115 at *Venice* 100 at *Modon*, and 156 at *Modon* 150 at *Corfu*, and 240 at *Corfu* 360 at *Negropont*, how many pounds of *London* make 100 *lb.* at *Negropont*?

Anſwer 84 $\frac{400666}{848,235}$.

Lon. Nor. Nor. Ven. Ve. Mod. Mo. Corf. Corf. Neg. Neg.
259 . 231 . 926 . 980 . 115 . 100 . 156 . 150 . 240 . 360 . 100 . 84 $\frac{420866}{248911}$

The product of the firſt, third, fifth, ſeventh, and ninth and eleventh numbers multiplied continually is Dividend, viz. 259 x 926 x 115 x 156 x 240 x 100 = 103262927040000.

The product of the ſecond, fourth, ſixth, eighth and tenth Numbers ſo multiplied is Diviſor, viz. 231 x 980 x 100 x 150 x 360
= 1222452000000

And the Anſwer will bee found *prout ſupra.*

Obſerv. That the ſecond and third numbers are of one Denomination.

The fourth and fifth of another.

The ſixth and ſeventh of another.

The eighth and ninth of another.

The tenth and eleventh of another. And when the operation is performed, the firſt and twelfth of another.

This queſtion may bee wrought by the Rule of Three at five Operations.

By the firſt Compound Rules at fewer Operations.

By this at one Operation.

Of Meaſure.

Queſt. 1 If 5 Ells Flemmiſh make 3 Ells Engliſh, and 5 Ells Engliſh make 9 Braces of Venice, how many Ells Flemmiſh make 50 Braces of Venice.

By the 12th. Rule of the 17th. Chapter the Anſwer will be found 46 $\frac{8}{27}$ Flemmiſh.

Queſt. 2 If 3 Ells Engliſh make 5 Ells Flemmiſh, and 50 Ells Flemmiſh 54 Braces of Venice, how many Braces of Venice make 50 Ells Engliſh.

By the 11th. Rule of the 17th. Chapter, the Anſwer will bee found 90 Braces of Venice.

Queſt. 3 If 600 Ells at *London* bee 2884 Palmes of *Genua*, and 721 Palmes of *Genua* bee 321 Braces at *Milan*, and 428 Braces at *Milan* bee 111 Canaes at *Rome*, how many Canaes at *Rome* make 100 Ells at *London*?

By the 13th. Rule of the 17th. Chapter, the Anſwer will bee found 55 $\frac{1}{2}$ Canaes at *Rome*.

Queſt. 4 If 125 yards at *London* bee 208 Ells at *Cullen*, and 625 Ells at *Cullen* bee 500 Ells at *Antwerp*, and 55 Ells at *Antwerp* 30 Ells in *France*, and 572 Ells in *France* 625 Varras at *Madera*, and 125 Varras at *Madera* 120 Varras at *Lisbone*, how many yards at *London* in 1000 Varras at *Lisbone*?

By working as is directed in the 6th. queſtion of Weight in this Chapter, the Anſwer will bee found 1312 $\frac{3127}{3745}$.

Of loſs and gain without time.

Queſt. 1 If a yard of Cloath which coſt 6 *s.* 8 *d.* bee retailed for 7 *s.* 6 *d.* how much is gained *per Cent*?

Anſwer 12 *l.* 10 *s.*

$\frac{1}{3}$—$\frac{3}{8}$: : $\frac{100}{1}$—112 $\frac{1}{2}$ *l.* which ſhews the gain 12 *l.* 10 *s.* *per Cent.* but better thus, 7 *s.* 6 *d.*—6 *s.* 8 *d.* = 10 *d.* then the difference between the buying and ſelling price being 10 *d.* ſay, If $\frac{1}{3}$ *l.* - $\frac{1}{24}$ *l.* :: $\frac{100}{3}$ *l.*—12 $\frac{1}{2}$ *l.* Every Noble gets 10 *d.* which is $\frac{1}{24}$ *l.* therefore 300 Nobles (being 100 *l.*) ⌶ 24 = 12 $\frac{1}{2}$ *l.*

Queſt. 2 If I gain 12 *l.* 10 *s.* in laying forth 100 by retailing a yard for 7 *s.* 6 *d.* how much coſt the yard ready money?

Anſwer $\frac{1}{3}$ *l.*

Add the gains to 100 *l. viz.*

100 † 12 $\frac{1}{2}$ = 112 $\frac{1}{2}$ then

If 112 $\frac{1}{2}$ *l.* | 100 *l.* :: 3 $\frac{3}{8}$ *l.* $\frac{1}{3}$ *l.* for proof of the former queſtion.

Queſt. 3 A Draper hath two peeces of Cloath containing 40 yards, one of 16 yards, which coſt 12 *s.* 6 *d.* *per* yard, another of 24 yards, which coſt 17 *s.* 6 *d.* *per* yard. If hee ſell them one with another for 14 *s.* *per* yard, what doth hee gain or loſe, and how much *per Cent*?

Anſwer, hee doth loſe 9 $\frac{21}{31}$ *per Cent.*

16 Yards at 12 *s.* 6 *d.* coſt——10 *l.*
24 Yards at 17—6 coſt——21

40 Yards coſt in all————31

40 Yards ſold at 14 *s.* *per* yard—28 which ſubſtracted from 31, leaves 3 *l.* loſs. Then

If 31 *l.* 3 *l.* :: 100 *l.* 9 $\frac{21}{31}$ *l.*

Queſt. 4 A peece of Canvas containing 26 yards, coſt 24 *s.* and 4 yards are ſold out of the peece for 12 *d. per* yard, at what price the yard muſt the reſt be ſold, to loſe in the whole peece after 8 *l. per Cent.*?

Anſwer at $9\frac{237}{275}$ *d.*

If 100 *l.* 92 *l.* :: 24 *s.* $22\frac{2}{25}$ *s.* ſubſtract 4 *s.* the monies received for the 4 yards ſold, from $22\frac{2}{25}$, the price at which it muſt be ſold to loſe 8 *l. per Cent.* and there reſts $18\frac{2}{25}$, then if 22 yards unſold muſt be ſold for $18\frac{2}{25}$, one yard muſt be ſold at $9\frac{237}{275}$ *d.* and the terms given, and the Anſwer ſtand thus.

$\frac{452}{550}$*s.* = $9\frac{237}{275}$*d.*   22 . $18\frac{2}{25}$ :: 1 . $9\frac{237}{275}$*d.*

All other neceſſary varieties relating to this Rule of Loſs and Gain without time, will be found in the 11th. and 12th. queſtion of the 14th. and the 9th. queſtion of the 15th. chapter.

Loſs and gain with time.

Qu. 5 If an Ell of Holland which coſt 5 *s.* ready money be ſold for 4 *s.* payable at 8 mo. how much is loſt *per. cent. per annum*?

Anſwer 30 *l.*

Or thus,

s. s. l. l. } s. mo. s.
5 . 1 :: 100 . 20 { 5 . 8 . 1
mo. l. mo. } l. mo. l.
8 , 20 :: 12 . 30 } 100 . 12 . 30

Qu. 6 If an Ell of Holland delivered for 4 *s.* to be paid at 8 months loſe 30 *l. per Cent.* in 12 months, what coſt the Ell ready money?

e the confution of thoſe ...eſtions of ...ſs and gain at ...e foot of the 8th. chapter.

mo. *l.* mo. *l.*
12 . 30 :: 8 . 20
l. *s.* *s.*
80 . 100 :: 4 . 5

If 12 mo. loſe 30 *l.* 8 mo. will loſe 20 *l.* ſubſtract that from 100, reſts 80, then if 80 come of 100, of what came 4 *s*? *facit* 5 *s.*

Qu. 7 If a yard of Velvet coſt 20 *s.* ready mony, for how long time muſt it bee ſold at 19 *s.* to loſe 15 *l. per Cent*?

Anſwer 4 months.

l. *s.* *l.* *l.*
1 . 1 :: 100 . 5
l. mo. *l.* mo.
15 . 12 :: 5 . 4

Qu. 8 If a yard of Cloath ſold for 14 *s.* payable at 6 months gain 10 *l.* in the 100 in 12 months, for how much muſt a yard of the ſame Cloath be ſold payable at 9 months to gain 20 in the 100 in 12 months?

Anſwer 15 ⅓ ſhilling.

The yard ſold for 14 *s.* coſt 13 ⅓ ready money.

mo. *l.* mo. *l.*
12 . 10 :: 6 . 5
12 . 20 :: 9 . 15
l.
105 . 100 :: 14 . 13 ⅓
100 . 115 :: 13 ⅓ . 15 ⅓ for Anſwer

For more variety in this Rule ſee the 12th. 13th. 14th. and 15th. queſtions in the 17th. Chapter.

Of Factorage diſtinguiſhed into two ſorts.

First. *Qu.* 1 If a Factor receive 1200 *l.* from a Merchant, to have $\frac{1}{4}$ of the gains for Factorage, what's the eſtimation of the Factors perſon?

Anſwer 400.

$\frac{3}{4} . \frac{1200}{1} :: \frac{1}{4} . 400.$

Qu. 2 A Merchant delivered his Factor 1200, conditionally that the Factor ſhall have ſuch part of the gain, as if hee had put in 400 *l.* what's the Factors proportion of the gains?

Anſwer $\frac{1}{4}$.

1200 † 400 = 1600 Then

If 1600 . 1 :: 400 . $\frac{1}{4}$

In this firſt Acception, If the eſtimation of his perſon be $\frac{1}{4}$, it is underſtood hee ſhall ſhare $\frac{1}{4}$ of the gains, and the Merchant the other $\frac{3}{4}$; ſo if the gains were 1200 *l.* the Factor ſhould have 300, the Merchant 900; if 1600, the Factor 400 the Merchant 1200.

Secondly. A Factor receives 1200 conditionally, to have $\frac{1}{4}$ (that is, 300 *l.*) then 300 *l.* (the eſtimation of his perſon) is admitted to compleat the 1200 to 1500 *l.* of which 300 is but $\frac{1}{5}$; ſo though the eſtimation of his perſon be $\frac{1}{4}$ of the money delivered, yet hee hath but $\frac{1}{7}$ of the gain, and in this ſecond Acception, if the gains be 1200, the Factor hath but 240; If 1600 but 320.

Qu. 4 A Factor receives 5860 *l.* for Traffick, his perſon is eſtimated at 1000; The accounts compleated, the gains appear to be 20 *l. per Cent.* what's the Factors part?

Anſwer 200.

Eſtimation of
his perſon 1000 † 5860, his credit = 6860.
100 . 20 :: 6860 . 1372
6860 . 1 :: 1000 . $\frac{50}{343}$ then $\frac{50}{343}$
Of 1372 *l.* = 200 the Factors part.

Qu. 5 A Merchant delivered 1400 *l.* to his Factor, and valued his perſon at 400 *l.* At the years end the gains were found 240 *l.* what was the Factors part?

Anſwer 53 $\frac{1}{3}$ *l.*

Eſtimation of
his perſon 400 † 1400, credit = 1800
1800 . 240 :: 400 . 53 $\frac{1}{3}$ the Factors part.

See the obſervation at the foot of the firſt Rule of the 11th. chapter.

Qu. 6 A Factor receives 3000 *l.* from a Merchant, with which hee imployes 800 *l* of his own, and his perſon is eſteemed at 600 *l.* more, what's the Factors part of the gains?

Anſwer $\frac{13}{38}$.

3800

3800 . 1 :: 800 . $\frac{4}{19}$ for the Factor, which ſubducted from $\frac{19}{19}$, leaves $\frac{15}{19}$.

3600 . $\frac{15}{19}$ :: 600 . $\frac{5}{38}$ more for the Factor.

$\frac{4}{19}$ and $\frac{5}{38}$ reduced are $= \frac{247}{722}$ which meaſured by 19, the greateſt common meaſure, will bee found $\frac{13}{38}$.

Now $\frac{4}{19}$, and $\frac{5}{38}$ added, are $=$ to $\frac{13}{38}$ for the Factor, which ſubſtracted from $\frac{38}{38}$, leaves $\frac{25}{38}$ for the Merchants gains.

Barter.

Qu. 1 How many pounds of Sugar at 14 *d. per lb.* muſt be given in *Barter* for 298 *lb.* of Pepper at 2 *s.* 5 *d. per lb*?

d. *d.* *lb.*
14 . 29 . 298 The Terms are not Methodically ranked, yet the third number × the ſecond and ∸ third $= 617\frac{2}{7}$ *lb.* Sugar, which is a true ſolution. The reaſon whereof is obvious.

Or thus, 1. 29 :: 298 . 8642 (*l.* *d.* *lb.* *d.*)
14 . 1 :: 8642 . $617\frac{2}{7}$ (*d.* *lb.* *d.* *lb.*)

Or thus, 14 . 29 . 298

$$\begin{array}{r} 298 \\ 21\frac{2}{7} \\ \hline 617\frac{2}{7} \end{array}$$ *lb.* Sugar.

In 29 there is twice 14, and $\frac{1}{14}$, therefore double the third number, and add $\frac{1}{14}$, which is beſt.

Qu. 2 What ſhall 7 *s.* 6 *d.* in ready money be worth in *Barter*, when 20 *d.* is worth 2s. 6 *d*?

Anſwer 11¼ *s.*

d. *d.* *d.* *d.* *d.*
20 . 10 :: 90 . 45 then 90 † 45 = 135
Better thus 20 . 30 :: 90 . 135
Beſt thus 90 ⌶ 2 = 45 & 90 † 45 = 135 *d.*

Qu. 3 How much Sugar will be equivalent to 756 *lb.* of Ginger, when Sugar at 12*d.* is bartered at 14 *d.* for Ginger at 12 *d.* which is worth but 10 *d. per lb.* ready money?

Anſwer 648 *lb.*

d. *d.* *lb.*
14 . 12 . 756
d. *lb.* *d.*
12 . 756 . 14

If † you work the three firſt Terms, as in the Rule Direct, the Anſwer will be true; work the three laſt Terms as in the Rule Inverſe, and the Anſwer will be the ſame: but the Terms I omit to order artificially, becauſe the Learner may ſee the varieties of working, which well conſidered, will make much to his advantage. The uſual way thus,

† The three firſt terms ordered, as in the Rule Direct, will give a true ſolution, the three latter ordered, as in the Rule Inverſe will do the ſame.

lb. *d.* *lb.* *d.*
1 . 12 :: 756 . 9072
d. *lb.* *d.* *lb.*
14 . 1 :: 9072 . 648 for Anſwer.

Qu. 4 When Sugar at 14 *d.* is bartered for Nutmegs at 5 *s. per lb.* which are worth but 4 *s.* ready money, what price muſt the *lb.* of Sugar bear to loſe 10 *l.* in the 100 *l.*?

s. *s.* *d.*
4 . 5 . 24 will give 17 $\frac{1}{2}$ *d.*
l.
100 . 90 . 17 $\frac{1}{2}$ will give 15 $\frac{3}{4}$ *d.* the price that a *lb.* of Sugar muſt be ſold for to loſe 10 *l.* in the 100.

Qu. 5 When Silks at 4 *l.* ready money are barterd at 5 *l.* for Worſteed at 50 *s.* *per* peece, what price muſt the Worſteed bear in Barter to gain 10 *l.* *per Cent.* Add to 50 *s.* $\frac{1}{10}$ part thereof, *viz.* 5 *s.* Then
If 4 *l.* 5 *l.* 55 *s.* will give 3 *l.* 8 *s.* 9 *d.* the price that a peece of Worſteed muſt bear to gain 10 *l.* in 100 *l.*

Qu. 6 Ginger at 3 *s.* *per* pound is barterd at 3 *s.* 6 *d.* for Gum at 3 *l.* 15 *s.* *per Cent.* which is worth but 3 *l.* ready money, which ſurmounts the other, and how much *per Cent*?
s. *s.* *d.* *l.* *l.* *s.*
3 . 3 . 6 :: 3 . 3 . 10 ſo the Gum ſurmounts 5 *s.* in 70 *s.* Then if 70 *s.* ſurmount 5 *s.* 100 *l.* will ſurmount 7 *l.* 2 *s.* $\frac{6}{7}$, and ſo much hee loſeth *per Cent.* who barters the Ginger.

Qu. 7 *A.* hath 100 yards of Velvet at 3 *l.* *per* yard, ready money, which hee barters with *B.* at 4 *l.* *per* yard, taking Grograms at 7 *l.* 10 *s.* *per* peece, which are worth but 6 *l.* ready money. Now how many peeces of Grogram pay for the Velvet, and which ſurmounts the other A, or *B.* and how much ?

l. . *l.* . *l.* *l.*
3 . 4 :: 6 . 8
ſ. *l.* *ſ.* *l.*
1 . 4 :: 100 . 400
l. *ps.* *l.* *ps.*
7½ . 1 :: 400 . 53⅓ of Grogram.
ps. *l.* *ps.*
1 . 6 :: 53⅓ . 320 which is more by 20 *l.* than the Velvet is worth, whereby it is evident, that *B.* loſeth 20 *l.* by the Barter.

Or thus,

l. *l.* *l.* *l.*
If 3 . 4 :: 6 . 8 So the Grograms which are barterd but at 7 *l.* 10 *s.* ſhould have been barterd at 8 *l.* to equal the Barter, then if 8 *l.* loſe 10 *s.* 320 *l.* will loſe 20 *l.*

But if, ſuppoſing *B.* to loſe 10 *s.* in every peece of Grogram, you ſhould ſay thus, If one peece loſe 10 *s.* what will 53⅓ loſe ? the Anſwer would be found 26⅔ *l.* which is erronious. You muſt therefore carefully obſerve when the queſtion is looſe, and when it pincheth.

Obſerve that 8 *l.* falls to 7 *l.* 10 *s.* So it is not 7 *l.* 10 *s.* that loſeth 10 *s.* but 8 *l.*

The 6th. queſtion asketh, which ſurmounts the other, and how much *per Cent.* this onely asketh which ſurmounts the other, and how much ? not how much *per Cent.* But if you ſhould extend the queſtion, and ask how much *per Cent.* the one ſurmounts the other, the Anſwer would bee 6 $\frac{1}{4}$ *l.*

l. *l.* *l.* *l.*

For if 320 . 300 :: 100 . 93 $\frac{3}{4}$ which is 6 $\frac{1}{4}$ *l. per Cent.* loſs. And for proof you may invert the queſtion, and ſay, if 100 *l.* loſe 6 $\frac{1}{4}$, what will 320 *l.* loſe? and the Anſwer will be 20 *l.*

Qu. 8 *A.* barters with *B.* 24 Bales of Callico worth 10 *l.* 10 *s. per* Bale ready money, for Allome worth 24 *s. per* Quintal, how many Quintals of Allome are equivalent to the Callicoes?

Anſwer 210 Quintals.

B. *s.* *s.* *Q.* *B.* *Q.*

1 . 210 . 24 . 1 . 24 . 210 *Quintals* of Allome by the 11th. Rule of the 17th. Chapter.

The queſtion inverted for proof.

B. Barters with *A.* 210 *Quintals* of Allome worth 24 *s. per* Quintal ready money, for Callicoes worth 10 *l.* 10 *s. per* Bale, how many Bales of Callicoe will countervail 210 quintals of Allome.

Anſwer 24 Bales.

Q *s.* *s.* *B.* *Q.* *B.*

1 . 24 . 210 . 1 . 210 . 24

Or the queſtion reduced will ſtand in Fractions thus,

B. *l.* *l.* *q.* *B.*

$\frac{1}{1}$. $\frac{21}{2}$. $\frac{6}{5}$. $\frac{1}{1}$. $\frac{24}{1}$ And the Terms x for Dividend and Diviſor as in the Rule and

Chapter laſt mentioned, the Anſwer will bee found the ſame.

Or multiply continually the Denominators of the firſt and third Terms, *viz.* 1 and 5 into 21, 1 and 24 the Numerators of the ſecond, fourth and fifth Terms for Dividend: And 2, 1 and 1, the Denominators of the ſecond, fourth and fifth Terms into 1 and 6, the Numerators of the firſt and third Terms for Diviſor, and the Anſwer will bee the ſame.

Moſt Authors extend this Rule to the anſwering of queſtions of like nature, with that which follows.

Qu. 9 A. hath Chamlets at 50 *s. per* peece ready money, which hee barters at 3 *l.* To what price muſt *B.* raiſe Silk at 21 *s. per lb.* to equal the Barter, when hee paies A. $\frac{1}{2}$ ready money?

Anſwer 28 *s.*

For ready money abate $\frac{1}{3}$ of 60 (which is 20) firſt from 50 the true price, and there reſts 30 for the firſt number in the Golden Rule, then from 60 the bartering price, and there reſts 40 for the ſecond number, ſo 21 is the third. Then

s. *s.* *s.* *s.*
30 . 40 :: 21 . 28 the price for which the pound of Silk muſt be ſold in Barter.

The *Q*ueſtion inverted for proof.

A. barters Chamlets for 3 *l. per* peece which,

which are vendible but for 50 *s.* for Silk at 28 *s. per* pound, to have $\frac{1}{3}$ preſent money, what's the true value of a pound of Silk?

Anſwer 21 *s.*

Firſt abate $\frac{1}{3}$ *from* 60 *the bartering price, and there remains* 40 *for the firſt number in the Golden Rule, next from* 50 *the true price, and there remains* 30 *for the ſecond number, and* 28 *is the third.* Then

s. *s.* *s.* *s.*
40 . 30 :: 28 . 21

The proof of the work by Inverſion of the queſtion, carries ſome colour of reaſon with it to aſſert the validity of this Rule; yet I muſt let the Learner know, in the firſt place, that this Rule hath no clear foundation, and in the next, that it is not materially uſeful, and therefore I neither beleeve it, nor commend it, nor confute it. The two following queſtions are likewiſe of the ſame ſtamp, yet ſhould I omit them, 'tis poſſible I may bee quarrelled for curtolliſing the Rules, therefore I think fit to inſert them, not by way of Caution only, but to prevent Cavil alſo.

Qu. 10 A. barters with *B.* Silk-Stockings at 30 *s. per* pair, which are vendible but for 26 *s.* to have $\frac{1}{3}$ ready money, and gain 10 *l. per Cent.* for ſtuff at 4 *s. per* yard ready money, how muſt the yard of ſtuff be valued to equal the Barter?

Anſwer at 5 $\frac{13}{15}$ *s.*

l. *l.* *s.* *s.*
100 . 110 :: 30 . 33 Then $\frac{1}{3}$ of 33 is 11, which abated from 26 the true price, leaves 15 for the firſt number, and alſo from 33 the bartering price, leaves 22 for the ſecond, and 4 *s.* the price of the ſtuff is the third. So

s. *s.* *s.* *s.*
If 15 . 22 :: 45 . $\frac{13}{15}$ the price of the yards of Stuff in Barter.

The queſtion inverſed.

B. hath ſtuff which hee Barters with A. at 5 $\frac{13}{15}$ *s.* *per* yard for Silk-Stockings at 30 *s.* *per* pair, which are worth but 26 *s.* *per* pair in ready money, and hee paies him $\frac{1}{3}$ ready money, and permits him to gain 10 *per Cent.* beſides. What was the juſt price of the yard of ſtuff in Barter?

l. *l.* *s.* *s.*
100 . 110 :: 30 . 33
s. *s.* *s.* *s.*
22 . 15 :: 5 $\frac{13}{15}$. 4

The $\frac{1}{10}$ of 30 (which is 3) added to 30 = 33, then $\frac{1}{3}$ from 33 the Bartering price, leaves 22 the firſt, and $\frac{1}{3}$ from 26 the true price, leaves 15 the ſecond, and 5 $\frac{13}{15}$ is the third.

A. barters with *B.* Cloves at 6 *s.* for 7 *s.* 6 *d.* *per lb.* and loſes 10 *l* *per Cent.* to have $\frac{1}{3}$ ready money, what's the juſt price of a yard of Velvet delivered at 22 *s.* to equal the Barter?

Anſwer 18 $\frac{7}{10}$ *s.*

Subſtract from 7 *s.* 6 *d.* the $\frac{1}{10}$ thereof, which is 9 *d.* reſt 6 *s.* 9 *d.* for if 100 loſe 10 *l.*

then 7 *s.* 6 *d.* will loſe 9 *d.* Next for $\frac{1}{3}$ ready money, which hee deſires, abate from 7 *s.* 6 *d.* the bartering price $\frac{1}{3}$ thereof (which is 2*s.*6*d.*) there reſts 5 *s.* for the firſt number, then 2 *s.* 6 *d.* from 6 *s.* 9 *d.* reſts 4 *s.* 3 *d.* for the ſecond. Then

$\frac{5}{1}$ *s.* — $\frac{17}{4}$ *s.* :: $\frac{22}{1}$ *s.* — $18\frac{3}{10}$ *s.*

Of Tret and Tare, &c.

There is a cuſtome in *London* in weighing ſome Commodities, not found or practiſed in any other place, called beyond the Seas, the Courteſies of *London*, *viz.* An Allowance of 4 in 104 called Tret, and an Allowance of 2 *lb.* upon every draught which exceedeth 336 *lb.* or 3 *C.* groſs called Cloffe, &c. What Tare is, and how ſubſtracted from the Groſs to finde the ſubtle, and how the Tret is found and ſubſtracted from that to finde the Neat, is manifeſted by ſeveral Queſtions of Reduction of Weight in the 6th. Chapter, yet 'tis neceſſary that the Learner underſtand the following Queſtions.

Map of Commerce, chap. 272.

A Grocer ſells to two Chapmen, *A.* and *B.* each an equal quantity of Grocery wares, weighing 984 *lb.* at 7 *l.* *per Cent.* ſubtle, but allows them their choice of taking or abating 4 *lb. per* 100 *lb.* for Tret, that is, of taking 104 *lb.* for 100 *lb.* or 100 *lb.* for 96 *lb.* *A.* takes 104 for 100, and *B.* 100 for 96 *lb.* whether hath *A.* or *B.* the better bargain?

lb. lb. tret. lb.

A. 1 984 ÷ 26 = $37\frac{11}{13}$ and 984 — $37\frac{11}{13}$ = $946\frac{2}{13}$

lb. l. lb. l.

Then 100 . 7 :: $946\frac{2}{13}$. $66\frac{3}{13}$

lb. l. lb. lb.

Or 104 . 7 :: 984 . $66\frac{3}{13}$

lb.

B. 2 984 ÷ 25 = $39\frac{9}{25}$ for tret, and 984 — $39\frac{9}{25}$

lb. l. lb. l.

= $944\frac{16}{25}$ Then 100 . 7 :: $944\frac{16}{25}$. $66\frac{78}{625}$

A. payes $66\frac{3}{13}$ lb.
B. payes $66\frac{78}{625}$ Now.

$\frac{3}{13}$ — $\frac{78}{625}$ l. = $\frac{861}{8125}$ l. loſs or difference in every 100 lb. weight, which in 984 lb. is, $\frac{2681}{20625}$ l. loſs or difference, and ſo much the better hath A. of the bargain.

lb. l. lb.

Or 100 — 4 = 96 Then

100 . 96 :: 984 . $944\frac{16}{25}$ l.

lb. l. lb.

100 . 7 :: $944\frac{16}{25}$. $66\frac{78}{625}$ l.

In the ſecond operation, where B. takes 100 for 96, 984 is ÷ 25, becauſe 25 is $\frac{1}{4}$ of 100, as 26 is $\frac{1}{4}$ of 104.

At 20 d. per lb. what will $377\frac{1}{4}$ coſt, 4 lb. being allowed upon every 100 lb. for Tret?

Answer $30\frac{95}{416}$ l.

1 lb. $\frac{1}{12}$ l. :: 100 lb. $8\frac{1}{3}$ l.

104 . $8\frac{1}{3}$ :: $377\frac{1}{4}$. $30\frac{95}{416}$ l.

It

In 8 Hogſheads containing 58. C. $\frac{1}{4}$ 12 *lb.* groſs, Tare 420 *lb.* 4 *lb. per* 104 *lb.* Tret, and 2 *lb.* on every Hogſhead that contains above 300 C. weight for Cloffe, how much neat weight, and what the value thereof at 13 $\frac{3}{4}$ *d.* *per lb.* 97 *l.* 16 *s.* 8 *d.* deducted for Cuſtomes and petty Charges.

Anſwer 237 *l.* 19 *s.* 00 *d.* $\frac{3}{4}$.

58 C. $\frac{1}{4}$ 12 *lb.*
4

233
28

1866
467

6536 groſs
420 tare

6116 ſubtle
225 tret

5881.
20 Cloffe

$\frac{1}{8}$|5861 neat *lb.* at 13 $\frac{3}{4}$ *per lb.*
732—7 . $\frac{1}{2}$
122—1 . $\frac{1}{4}$

671|5
335 . 15 . 8 . $\frac{3}{4}$
97 . 16 . 8

237 . 19 . 00 . $\frac{3}{4}$

26) 6116 (235 $\frac{6}{26}$|$\frac{3}{13}$
52

91
78

136
130

6

The tret ſubſtracted from the ſubtle, reſts 5881, which ÷ 300 quotes 19 $\frac{181}{300}$ Cloffe, for which I ſet down 20, which in ſuch caſes is allowable, the fractional part of a *lb.* being inconſiderable, & for that reaſon $\frac{3}{13}$ *lb.* tret is thrown off likewiſe.

Of Lengths and Breadths.

Queſt. 1 How many ſquare Ells are contained in a peece of Tapeſtry that is $9\frac{2}{3}$ length and $2\frac{3}{4}$ in breadth?

Anſwer $26\frac{7}{12}$ for $9\frac{2}{3}$ x $2\frac{3}{4} = 26\frac{7}{12}$.

Queſt. 2 If a peece of Tapeſtry containing $26\frac{7}{12}$ ſquare Ells bee $2\frac{3}{4}$ Ells broad, what's the length of the peece?

Anſwer $9\frac{2}{3}$ for $26\frac{7}{12}$ ⌶ $2\frac{3}{4} = 9\frac{2}{3}$.

Qu. 3 If a peece containing $26\frac{7}{12}$ ſquare Ells bee $9\frac{2}{3}$ in length, what's the breadth?

Anſwer $2\frac{3}{4}$ for $26\frac{7}{12}$ ⌶ $9\frac{2}{3} = 2\frac{3}{4}$.

Qu. 4 How many Ells $\frac{3}{4}$ ſquare are contained in $5\frac{1}{4}$ Ells of Arras of $1\frac{1}{4}$ broad.

Anſ. 35 for the product of $5\frac{1}{4}$ x $1\frac{1}{4}$ ⌶ $\frac{3}{4} = 35$.

Or $5\frac{1}{4}$. $1\frac{1}{4}$ :: $\frac{3}{4}$. 35.
Or 21 . 5 :: 3 . 35.

Qu. 5 How many skins of a foot ſquare will line a Carpet that is $7\frac{1}{2}$ yards in length, and 7 quarters broad?

Anſ. $118\frac{1}{8}$ for the length x the breadth $= 13\frac{1}{8}$ then

yard ſquare foot yards ſquare.
1 . 9 :: $13\frac{1}{8}$. $118\frac{1}{8}$ skins of a foot ſquare.

Qu. 6 How many ſquare yards are contained in a peece of Wainſcot $32\frac{1}{2}$ foot long, and $9\frac{1}{2}$ high?

Anſwer 34 yards $2\frac{3}{4}$ feet ſquare.

$32\frac{1}{2}$ x $9\frac{1}{2}$ = $308\frac{3}{4}$ then 308 ⌶ 9 will quote 34 yards, $2\frac{3}{4}$ feet ſquare *prout ſupra.*

Qu. 7 How many Tiles of $10\frac{1}{2}$ inches in length, and $6\frac{1}{4}$ in breadth will pave twenty ſquare yards?

Anſwer $394\frac{34}{35}$ for 36 x by 36 = 1296 the ſquare inches in a ſquare yard, and 1296 x 20 the number of ſquare yards in the *Queſtion* = 25920, which ⌶ $65\frac{5}{8}$ the product of $10\frac{1}{2}$ x $6\frac{1}{4}$ = $394\frac{34}{35}$ for Anſwer.

Qu. 8 How many Ells of Tapeſtry will hang a Room that is 3 yards in height, 5 in length, and 4 in breadth?

Anſwer 96, for 3 multiplied by 5 the length into the height = 15 and 15 † 15 the length doubled (becauſe there are 2 ſides called lengths) = 30 yards for the whole length, then 4 † 4 the breadth doubled = 8, which x 3 the height = 24 the yards in breadth, and 30 † 24 = 54 the full length and breadth.

The Flemmiſh Ell holding the ſame proportion to our yard, as 3 to 4 ſay

If 4 . 54 :: 3 . 72 then 72 x 4 and ⌶ 3 = 96 Flemmiſh, for

If 72 . 4 :: 3 . 96 Flemmiſh, which anſwers the queſtion. Or 16 being the ſquare of 4, and 3 the ſquare of 9, ſay

If 16 . 54 :: 9 . 96 at one operation.

Qu. 9 How many ſquare Ells Flemmiſh or Engliſh in a peece of Arras containing in length 20 $\frac{5}{8}$ Flemmiſh meaſure, and in breadth 5 $\frac{1}{5}$ Engliſh meaſure?

Anſwer 178 $\frac{3}{4}$ ſquare Ells Flemmiſh, or 64 $\frac{7}{20}$ ſquare Ells Engliſh. 5 $\frac{1}{5}$ Ells Engliſh reduced = 8 $\frac{2}{3}$ Flemmiſh, ſo the length is 20 $\frac{5}{8}$ and the breadth 8 $\frac{2}{3}$ Flemmiſh, then 20 $\frac{5}{8}$ x 8 $\frac{2}{3}$ = 178 $\frac{3}{4}$ ſquare Ells Flemmiſh.

5 $\frac{1}{5}$ x 5 and ÷ 3 = 8 $\frac{2}{3}$.

Then to know again how many ſquare Ells Engliſh the ſaid length and breadth containeth reduce 20 $\frac{5}{8}$ Flemmiſh to Engliſh, *facit* 12 $\frac{3}{8}$ in length, then 12 $\frac{3}{8}$ in length x 5 $\frac{1}{5}$ the breadth = 64 $\frac{7}{20}$ ſquare Ells Engliſh.

20 $\frac{5}{8}$ x 3 and ÷ 5 = 12 $\frac{3}{8}$.

For proof of the Queſtion, ſeeing 5 Ells Flemmiſh make but 3 Ells Engliſh

The ſquare of 5 is 25.
The ſquare of 3 is 9.

5 x 5 = 25
3 x 3 = 9 then

Flem.	Engl.	Flem.	Engl.
25 .	9 ::	178 $\frac{3}{4}$.	64 $\frac{7}{20}$

Again,

Engl.	Flem.	Engl.	Flem.
9 .	25 ::	64 $\frac{7}{20}$.	174 $\frac{3}{4}$

Qu. 10 When an Ell Flemmiſh coſt 2 $\frac{1}{3}$ *s.* what muſt I pay for 15 $\frac{1}{3}$ Ells Engliſh?

Anſwer 59 $\frac{17}{27}$ *s.* that is 2 *l.* 19 *s.* 7 $\frac{5}{9}$ *d.*

$\frac{3}{5}$ Ell

Ell s. Ell s.
$\frac{5}{3}$. $2\frac{1}{3}$ :: $15\frac{1}{3}$. $59\frac{17}{27}$ or the English meaſure reduced to Flemmiſh, *facit* $25\frac{5}{9}$.

Ell Flem. s. Ell Flem. s.
Then $\frac{1}{1}$. $2\frac{1}{3}$ :: $25\frac{5}{9}$. $59\frac{17}{27}$

Qu. 11 If a ſquare Ell Flemmiſh coſt $\frac{2}{3}$ *l.* what $13\frac{1}{5}$ ſquare Ells Engliſh?
Anſwer $24\frac{4}{9}$ *l.*

By the proof of the 9th. queſtion it appears that a ſquare Ell Flemmiſh is in proportion to a ſquare Ell Engliſh, as 9 to 25, therefore, If

Ell *l.* Ell. *l.*
$\frac{9}{25}$. $\frac{2}{3}$ :: $13\frac{1}{5}$. $24\frac{4}{9}$

Qu. 12 What will it coſt to hang a Room 73 foot 9 inches about, and 7 foot, 11 inches high, with Ell-broad ſtuff of 2 *s.* 3 *d.* $\frac{1}{4}$ *per* yard?
Anſwer 6 *l.* 0 *s.* 0. $\frac{25}{144}$ *d.*

$73\frac{3}{4} \times 7\frac{11}{12} = \frac{28025}{48}$
$3 \times 3\frac{3}{4} = 11\frac{1}{4}$ then
y. d. l. s. d.
$11\frac{1}{4}$. $\frac{121}{4}$ :: $\frac{28025}{48}$. 6 . 0 . 0 $\frac{25}{144}$

CHAP. 22.

Of Artificial or Decimal Arithmetick, Viz.

Notation, Reduction, Addition, Subſtraction, Multiplication and Diviſion, &c.

ALthough I am not of their opinion, who tell the world that all Arithmetical operations relating to Trade; are more ſpeedily and eaſily performed by Decimal than Natural Arithmetick, yet am I no enemy to the Artificial part, where it is unforc'd and materially uſeful. I confeſs, that queſtions performed by Vulgar fractions may frequently bee effected with more conveniency and facility by Decimal fractions, but unleſs the perſon who is converſant with Arithmetical Operations (ſuch as relate to Commerce) carry the Decimal parts of a *l.* &c. in memory, the uſeful queſtions commonly propoſed, may bee many times wrought by Natural Arithmetick, before the Decimals can be taken out of the Tables. Again, it is evident from the Operations at the end of this Chapter, that the queſtions which in ſeveral Authors are anſwered by Decimal Arithmetick, may be more readily reſolved by the Rules of Practice in the 14th. Chapter. But I cannot out of the world, and therefore (to pleaſe the Stationer) I muſt into the faſhion, and conclude it neceſſary that the Learner bee acquainted with both kinds, that hee may underſtand which to make uſe of to his beſt advantage. The Invention of Decimal Arithmetick, and its uſe in the Doctrine of plain Triangles, &c. I omit to mention (being it makes not for the preſent purpoſe) and proceed to the practice thereof.

Of Notation of Decimals.

1 *Notation of Decimals is different from that of whole numbers, for as whole numbers increaſe from the right hand towards the left in a decuple proportion from unity; ſo Decimals decreaſe from unity in the ſame proportion from the left hand to the right*, as is manifeſt by the Table following.

The Table of Notation.

Unites —— 1
Primes —— .1 ———— .$\frac{1}{10}$
Seconds —— .01 ———— .$\frac{01}{100}$
Thirds —— .001
Fourths —— .0001
Fifths —— .00001 ———— .$\frac{00001}{100000}$, &c.
Sixths —— .000001
Sevenths —— .0000001
Eighths —— .00000001
Ninths, &c. — .000000001

Hence it alſo appears that Decimal fractions are

Numerators of Decimal Fractions.

are of ſeveral Denominations, as Primes, Seconds, &c. and that the Numerators are produced by parting an Unite, viz. When a pound (an Unite) is divided into 10 equal parts, that Diviſion is called Primes, from the firſt Diviſion, and a Prime divided into the like number of equal parts is called ſeconds from the ſecond Diviſion, &c. So

One	Unite	makes 10	Primes
	Prime		Seconds
	Second		Thirds
	Third		Fourths
	Fourth		Fifths
	Fifth		Sixths
	Sixth		Sevenths
	Seventh		Eighths
	Eighth		Ninths
	Ninth		Tenths,

An Unite of any one kinde, making 10 of the next following.

2 *In parting an Unite according to the laſt Rule to produce a fraction, obſerve that 5 is the half of any Decimal Denomination whether Unite, Prime, Second, Third, &c, viz.* [illegible]

Divide 0 5 ſeconds, which repreſent a ſhilling by 2 the [illegible] quotient will bee 0 2 5 the fraction denoting 6 *d.* as in the firſt Example in the Margent, then divide 025 by the ſaid Diviſor, and the Quotient gives you the Decimal for 3 *d.* *Viz.* firſt the half of 0 is 0, the half of 5 is 2, then the half of 1 ſecond remaining is 5 thirds. Again, ſecondly, the half of 0 is 0, the half of 2 is one, the half of 5 is 2, and the half of one third remaining is 5 fourths.

Primes ſeconds thirds fourths

firſt 2) ,0 5

ſecond 2) 0 2 5

0 1 2 5

Denominators of Decimal Fractions.

3 *Decimal fractions have for their Denominators an Unite, with ciphers thereunto annexed, as* 10, 100, 1000, *&c. but the Denominators being certainly known to conſiſt of one place more than the Numerators, the Numerators may be only ſet down, and the Denominators omitted.* So $\frac{5}{10}$ may bee written thus ,5 and $\frac{25}{100}$ thus ,25 &c.

Mixt numbers.

4 *A mixt number conſiſting of a whole number, and a Decimal, as* 12, $\frac{25}{100}$ *may bee written thus,* 12,25 *for the comma interpoſed between* 12 *and* 25, *doth diſtinguiſh the whole number from the Decimal.*

Of Reduction of Vulgar Fractions to Decimals.

5 *To reduce a Vulgar Fraction to a Decimal, divide the Numerator increaſed with* 4 *or* 5, *or more ciphers at pleaſure by the Denominator, and the Quotient will bee the Decimal required.*

So

~~375~~0
~~1875~~

So ⅜ *l.* will be converted into the Decimal Fraction ·$\frac{375}{1000}$ *l.* which is equivalent to ⅜, as by the operation in the Margent is manifeſt, And although ſuch an exact proportion in the Decimal to the Vulgar Fraction, will not bee conſtantly found, yet the Decimal will alwaies retain ſo neer a proportion to the Vulgar fraction. that the difference cannot create any ſenſible or injurious errour, *viz.* ⅓ *l.* converted into a Decimal fraction, will be expreſſed thus, 3333, or thus, 33333, or thus, 333333, &c. which is very nearly, though not exactly equal to the ⅓, as by the operation in the Margent, for it is defective onely $\frac{4}{25}$ *q.*

375
20
Shil. 7|500
12
pence 6|000

3333
20
Shil. 6|6660
12
pence 7|9920
4
3|9680

Some add an Unite to the laſt place, expreſſing the Fraction thus, 3334 which then exceedeth the Vulgar Fraction $\frac{4}{25}$ *q.* (as in the Margent) and agree that human works require no more exactneſs.

3334
20
Shil. 6|6680
12
pence 8|0160|4
25
6 4

6 *A Compound fraction being firſt reduced to a ſingle fraction, may afterwards by the laſt Rule bee converted into a Decimal.* So $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ being reduced to $\frac{2}{5}$ as in the tenth Rule of the 8th. Chapter, may bee changed into the Decimal. 4, and by the former and following Rules, Obſervations and Directions, Tables may bee framed to expreſs the parts of Money, Weight, Meaſure, Time, &c. in Decimals.

A general Rule.

7 *In reducing a Vulgar Fraction to a Decimal, if the Unite place of the Denominator (which in all queſtions of Reduction will bee Diviſor) at the firſt demand extend but unto the firſt of the ciphers annexed to the Numerator of the Vulgar Fraction, (which will bee Dividend) there muſt bee no cipher put in the firſt place of the Quotient*, as in the Example of 19*s.* reduced to the Decimal 95 in the Table following, but if it extend to the ſecond, then one cipher muſt bee firſt placed in the quotient, as in the Example of 9 *d.* reduced to .0375. If to the third 2 ciphers muſt bee placed in the firſt part of the quotient, &c. as in the Example of a penny reduced to the Decimal ·00104167.

9

$\frac{190}{195}$

The

The Tables in Engliſh Coin in Decimals made apt for uſe in this kinde of Artificial Arithmetick.

The Table of Shillings in Decimals from 1 *s.* to 19 ſhillings.

Shillings	primes	seconds
1	0	5
2	1	
3	1	5
4	2	
5	2	5
6	3	
7	3	5
8	4	
9	4	5
10	5	
11	5	5
12	6	
13	6	5
14	7	
15	7	5
16	8	
17	8	5
18	9	
19	9	5

The Table of the parts of a ſhilling from 1 farthing to 11 *d.* 3 *q.*

		primes	seconds	thirds	fourths	fifths	sixths	sevenths	eighths
Pence	1	0	0	4	1	6	6	6	6
	2	0	0	8	3	3	3	3	3
	3	0	1	2	5				
	4	0	1	6	6	6	6	6	6
	5	0	2	0	8	3	3	3	3
	6	0	2	5					
	7	0	2	9	1	6	6	6	6
	8	0	3	3	3	3	3	3	3
	9	0	3	7	5				
	10	0	4	1	6	6	6	6	6
	11	0	4	5	8	3	3	3	3
Farthings	1	0	0	1	0	4	1	6	7
	2	0	0	2	0	8	3	3	3
	3	0	0	3	1	2	5		

These Tables ſerve inſtead of Reduction to expreſs the parts of pounds, ſhillings and pence, *viz.* If you would know how 5 *s.* 6 *d.* 3 *q.* would ſtand in Decimals, caſt your eye upon the Table of ſhillings, and againſt 5 ſhillings you will finde 25 that is 2 primes 5 ſeconds; and againſt 6 *d.* in the Table of pence 0 primes 2 ſeconds 5 thirds, and againſt 3 farthings in the table of farthings *primes ſecond thirds fourths fifths ſixths* 0 0 3 1 2 5 which added together, the total will bee as in the Margent 278125 the Decimal expreſſing 5 *s.* 6 *d.* 3 *q.* but if the Decimals in the Table of pence were raiſed but to 6 or 7 places it would bee ſufficient.

25
025
003125
278125

By the former Rules and Directions, thoſe who have occaſion may frame Tables to expreſs the Decimals of Weight, Meaſure, Time, &c. *viz.* If I would change ¾ *C.* Averdupoize great weight into a Decimal Fraction by the 5th. Rule in this Chapter I finde the Decimal 75. Again, if I would turn 11 ℥ Troy, which is $\frac{11}{12}$ *lb.* into a Decimal, proceeding according to that Rule I finde the Decimal of 11 ℥ to be 9166666, &c.

8 *The Value of a Decimal Fraction expreſſing the parts of Engliſh Coin may bee diſcovered by the firſt Rule of the 8th. Chapter, or the Marginal Operation in this Example, or theſe in the third Rule of this Chapter, but more concisely thus;*

		Prime	*Second*	*Third*	*Fourth*	*Fifth*	*Sixth*
		2	7	8	1	2	5
						2	0
Shil.	5	5	6	2	5	0	0
						1	2
Pence	6	7	5	0	0	0	0
							4
Farth.	3	0	0	0	0	0	0

It is apparent by the Tables that one prime is 2 ſhillings, 2 primes 4 *s.* and that 5 ſeconds is one ſhilling; But if the figure ſupplying the place of ſeconds be under or leſs than 5, as 4.3.2.1, then it ſtands but for 10 times ſo many farthings as 4 ſtands for 40, 3 for 30, 2 for 20, 1 for 10, but if it bee above or more than 5, as 6. 7. 8. 9, then ſubſtract 5 from that figure, and the remains ſtand for 10 times ſo many farthings as aforeſaid.

All numbers in ſeconds and thirds not exceeding 24, may bee reputed a juſt number of farthings. If they exceed 24, caſt away 1, and the remains are a juſt number of farthings, *viz.* To finde the value of the Decimal 278125 in the Example before-going; I ſay, 2 primes is 4 *s.* and 5 ſeconds ſubſtracted from 7 ſeconds is one ſhilling more; then 2 ſeconds and 8 thirds is 28 *q.* and becauſe the number exceeds 24, I caſt away 1, and there remains 27, which is 6 *d.* 3 *q.* and ſhews you that the Decimal Fraction expreſſeth 5 *s.* 6 *d.* 3 *q.* and this way is juſtly to be preferred before the other, becauſe the value of a Decimal in Engliſh Coin may bee diſcovered at ſight.

Examples.

primes	*ſeconds*	*thirds*	*fourths*	*fifths*	*Sixths*	*ſevenths*	*Eighths*		*l.*	*s.*	*d.*	*q.*
8	9	8	9	5	8	3	3	——	0.	17.	11.	3
7	8	9	5	8	3	3	3	——	0.	15.	09.	2
6	6	6	6	6	6	6	7	——	0.	13.	04.	0
4	0	3	1	2	3			——	0.	08.	00.	3
0	2	0	8	3	3	3	3	——	0.	00.	05.	0
0	0	4	1	6	6	6	7	——	0.	00.	01.	0

Addition of Decimals.

1 *In Addition of Decimals the ſame Order is to be obſerved, as in the Addition of Integers, in the ſecond, third, fourth, and fifth Rules of the ſecond Chapter*, viz. The total of the laſt 6 Decimal numbers ſo added, will bee 27833333. Now becauſe the numbers extend from primes to eighths, I cut off 8 places, and carry 2 Integers over the prime line, which repreſenteth 2 *l.* and the value of the Decimal will by the 8th. Rule bee found 15 *s.* 8 *d.* at ſight.

	primes	*ſeconds*	*thirds*	*fourths*	*fifths*	*ſixths*	*ſevenths*	*eighths*	*l.*	*s.*	*d.*	*q.*
	8	9	8	9	5	8	3	3	00	17	11	3
	7	8	9	5	8	3	3	3	00	15	09	2
	6	6	6	6	6	6	6	7	00	13	04	0
	4	0	3	1	2	5	0	0	00	08	00	3
	0	2	0	8	3	3	3	3	00	00	05	0
l.	0	0	4	1	6	6	6	7	00	00	01	0
2	7	8	3	3	3	3	3	3	02	15	08	0

2 *In adding Integers and Decimals together, obſerve the following order,* viz.

.l.	....	*l.*	*s.*	*d.*	*q.*
33	88645837	33	17	08	3
29	99791666	29	19	11	2
9	25	9	05		
48	85	48	17		
58	75	58	15		
7	65	7	13		
188	3843	188	07	08	1

Obſerv. Hence obſerve that the number of tens in the place of primes is to be carried to the place of Integers, which in the former Example is 2, and in this 4, and that there is no neceſſity of ſetting down Decimals beyond the place of fourths, for if the fifths, ſixths, ſevenths, and eighths had been added, they would have onely produced the fraction $\frac{7181}{10000}$ q. which is not materially ſignificant.

Subſtraction of Decimals.

1 *Subſtraction of Decimals differs nothing from ſubſtraction of whole numbers, viz.*

From the firſt of the ſecond 6 numbers in the ſecond Example in Addition, take the firſt of the 6 numbers in the firſt Example.

See the third Rule of the third Chapter.

	l.		*l.*	*s.*	*d.*	*q.*
From	33 . 88645837	—	33 .	17 .	8 .	3
take	. 89895833	—	00 .	17 .	11 .	3
Reſts	32 *l.* 98750004	—	32 .	19 .	09 .	0

2 If the 6 numbers in the firſt Example were to bee ſubſtracted from thoſe ſix in the ſecond Example, each of the 6 numbers muſt be added into a diſtinct total, and the leſſer total ſubſtracted from the greater; *viz.*

See the 5th. Rule of the third Chapter.

			l.	*s.*	*d.*	*q.*
From	188 . 3843, &c.	—	188 .	7 .	8 .	1
Take	— 2 . 7833, &c.	—	2 .	15 .	8 .	0
Reſts	185 . 6010		185 .	12 .	0 .	1

If the Decimals conſiſt not of equal places, ſupply that defect by annexing ciphers, or ſuppoſing ciphers to be annexed, as in the following Examples.

The proof is the ſame with that in ſubſtraction of whole numbers in the third Chapter.

.68000	.68.	84.04358
.04358	.04358	.65
63642	63642	83.39358

Of Multiplication of Decimals.

1 *Multiply the Terms given as if they were whole Numbers, according to the Rules in the fourth Chapter, and if both the Terms given bee Decimals, the product will bee a Decimal*, as in the firſt Example.

2 *But if a whole number bee adjoyned to the Decimal part, either in the Multiplicand, or Multiplier, or both, then cut off from the product towards the right hand by a prime line, ſo many places as are in the fractional parts of the Terms given, and that part of the product on the right hand ſo diſtinguiſhed, will bee a Decimal, and that on the left hand, Integers*, as in the ſecond, third, and fourth Examples.

The decimals are not onely diſtinguiſhed from the whole numbers by Commaes interpoſed between the parts, but for the Learners better obſervation pointed alſo.

First	Second
.83578	456
25	15
417890	2280
167156	456
2089450	68 $\frac{40}{100}$ which is $\frac{2}{5}$ or 8 *s.*

Third

```
      Third               Fourth
         ..                 ....
     248.27              9.0375
         ..                   ..
         26                8.24
     ------              -------
     148962              361500
     49654              180750
     -------           723000
        ....           --------
     64|5502             ......
                       74|469000
```

When there do not ariſe ſo many places in the product, as there are in the Decimal parts of both the terms given, you may fill the deficient places of the product on the left hand with one or more ciphers, as in the following Examples, to keep the places of primes, &c. But obſerve that a cipher in the place of primes is inſignificant, and in the place of ſeconds alſo, unleſs a figure precede it in the place of primes, and likewiſe in the place of thirds, unleſs a figure precede it, either in the place of primes or ſeconds, &c. as by the 8th. Rule is manifeſt.

```
        ..          ....
      .023         .0124
       .05         .0132
    ------       -------
    .00115           248
                    372
                   124
                 --------
                 ...
                 00016368
```

Diviſion by Decimals with whole and mixt Numbers.

1 Decimals or mixt numbers are divided like whole numbers, as in the fifth chapter, and if the Dividend bee greater than the Diviſor, the Quotient will bee a whole or mixt number, if leſs, a Decimal.

2 Ciphers may bee annexed or ſuppoſed to bee annexed to the Dividend to continue the Quotient to as many places as are requiſite, according to the condition of the Queſtion propounded.

3 When the Dividend and Diviſor are both mixt numbers; or one whole, and the other mixt, or the Dividend a Decimal, and the Diviſor a whole or mixt number, the Quotient will carry the ſame Denomination as the figure of the Dividend over the Unites place of the Diviſor.

Examples.

Example 1. The Dividend and Diviſor both mixt numbers.

Queſt. 1. How many *C.* weight Averdupoize will 559 *l.* 8 $\frac{1}{2}$ *d.* buy, when the Commodity is ſold for 16 $\frac{1}{3}$ *l. per C*?

C. *qu.* *lb.* ℥

Anſwer 34 . 0 . 25 . 6, &c. As by the Example following, *viz.*

16.3333)559.03541666
489.999

69.0364
65.3332

3.70321
3.26666

.436556
.326666

1098906
979998

1189086
1143331

.45755

C.
(34.|2267
4

no quarters—|9068
28

pounds 25|3904
16

ounces—6|2464

Example 2. The Dividend mixt, and the Diviſor a whole number.

Queſt. 2 How much Troy weight at 234*l.* *per Cent.* for 1367953 ¼ *l*?

Anſwer 5845 *C.* 3 *q.* 20 *lb.*

```
                              ..
234)1367953.25        (5845.95
    1170                     4
    ----                 -----
     1979             qu.3|80
     1872                  .25
     ----                 ----
      1075           lb.20|00
       936
      ----
      1393
      1170
      ----
       223.2
       210.6
       -----
        12.65
        11.70
        -----
          .95
```

If there had been any Remains, they muſt have been multiplied by 12 to finde the ℥. See the Obſervation upon Troy-weight at the foot of the firſt Rule of the eighth Chapter.

This Queſtion performed by Decimal Arithmetick, produceth for Anſwer 5845 *C.* 3 *q.* 20 *lb.* 4 ℥. $\frac{34}{39}$ ℥. ſo the difference is 4 $\frac{34}{39}$ ℥.

But by adding Cyphers to 95 the remains, and continuing the work, the Decimal fraction will bee found 95405, &c. and the ſolution will bee then agreeable to that found by natural Arithmetick, the difference in the fractional part of an ounce onely excepted.

Example 3. The Dividend a Decimal, the Diviſor a whole number.

Queſt. 3. What's the price of a yard of Twiſt, when I pay 12 *s.* 6 *d.* for 75 yards?

Anſwer 2 *d.*

After the ſame order of working you will finde, that when 3$\frac{2}{3}$ dozen of Lace coſt 11 *s.* 1 yard will coſt 3 *d.* if 11 *d.* one yard will coſt a farthing.

75) 625 (008
·600
——
25

The unites place of the Diviſor falls upon the place of thirds, therefore 2 ciphers are placed in the two formoſt places of the Quotient to keep the places of primes and ſeconds. Ciphers may here bee added to the Diviſor (as in the next Example) to increaſe 625 (the Decimal expreſſing 12 *s.* 6 *d.*) to 62500, as moſt Authors direct, and then the quotient will bee 00833, but this order is not material for the 2 laſt places, *viz.* 33 will repreſent but $\frac{33}{100}$ of a penny, which is ſo much above the true ſolution of the queſtion. And in the firſt Example before-going, where the Decimal is ſet down to eighths, as many direct, *viz.* 33541666, it is better to conſiſt but of 5 places at moſt, *viz.* 33541, the other 3 places being inſignificant.

See the 7th. Rule in the Notation of Decimals.

Example 4 The Dividend a whole or mixt number, the Diviſor a Decimal.

Queſt. 4 There is a parcel of Cloath which at 7 *s.* 6 *d.* *per* yard coſt 16 *l.* 17 *s.* 6 *d.* to be ſo diſtributed amongſt private ſouldiers, that every one may have a yard, the Queſtion is, * How many ſouldiers muſt ſhare the Cloath at that proportion?

* Or how many yards were in the peece.

Anſwer 45.

375) 16.875 (45 yards
1500
1875
1875

Queſt. 5 After the ſame order of working you will finde that 284 $\frac{1}{4}$ *l.* will buy 758 Ells of Cloath at $\frac{3}{8}$ *l. per* Ell.

A Cipher added to the Dividend. See the ſecond Rule, and the two following Examples.

375) 284.250 (758
262.5
21.75
18.75
3000
3000

Queſt. 6, & 7. After the like order of working you will finde that 72 *lb.* 9 *s.* will buy 966 Ells of Callico at 18 *d. per* Ell, and 7 *l.* will buy 453 $\frac{1}{3}$ yards of Dowlas at 9 *d. per* yard?

```
075)72.450(966 Ells of Callico.
    67.5
    ----
     4.95
     4.50
     ----
      450
      450


0375) ·17000000   (4.53|333, &c. yards
       1500                  of Dowlas.
       ----
       2000
       1875
       ----
        1250
        1125
        ----
         1250
         1125
         ----
          1250
          1125
          ----
           1250
           1125
           ----
            125
```

Example 5. *When the Terms given are both Decimals, and the Dividend greater than the Diviſor*, a late Writer ſaith in the 201 page of his book, printed 1657, *that the*

Leybourn.

the whole part of the Quotient will conſiſt of the ſame number of places as the Diviſor doth, and gives the following Examples to prove the Rule, *viz.*

Let the Decimal ·73958 bee ÷ the Decimal 32, the integral part of the Quotient will bee 23, because the Diviſor doth conſiſt of 2 places, as by the operation in the Margent doth appear, but (with reſpect to him) the operation cannot bee true, becauſe the Rule is falſe, for the Quotient ſhould bee 2.311, and the Rule thus.

```
         . . . . .
32) ·73958 (23.11
     . . . . .
     64
     ——
      99
      96
      ——
       35
       32
       ——
        38
        32
        ——
         6
```

Divide ſo many of the foremoſt places of the Dividend, as there are places in the Diviſor, and ſo many times as the Diviſor can bee found in thoſe places, ſo many Unites or Integers will bee in the Quotient, *viz.* 32 the Diviſor will bee found but twice in 73, the 2 foremoſt places of the Dividend, and ſo the whole parts of the quotient will conſiſt but of 2 Integers. Illuſtrated thus, The Decimal to be ÷ is ·73958 which expreſſeth 14 *s.* 9 *d.* 2 *q.* and the queſtion is, how many times the Decimal ·32, which repreſents 6 *s.* 5 *d.* is contained in 14 *s.* 9 *d.* 2 *q.* which by natural Arithmetick is found $2\frac{42}{114}$, and by Decimal Arithmetick $2\frac{211}{1000}$, after the ſame order of working .375 ⌶ 25 quotes 1.5, and .65750 ⌶ .04 quotes 16.437, as by the following operations appears.

```
 ..  ...            ..   .....     ..
 25) 375 (1.5       04) 65750 (16|437
      25
     125
     125
```

Example 6. When the Terms given are both Decimals, the Dividend the leſſer, the Quotient will bee a Vulgar Fraction, whereof the Dividend is Numerator, the Diviſor Denominator. So 15 *given to bee divided by* 37, *the Quotient will bee* $\frac{15}{37}$. *If the Terms given conſiſt not of equal places, the defects may bee ſupplied by annexing ciphers,* viz. *If* 5 *bee given to bee* ⌶ .87569, *the Quotient will bee* $\frac{50000}{87569}$, *which may bee reduced into a Decimal by the fifth Rule of this Chapter.*

Queſtions collected from ſeveral Books performed by Decimal Arithmetick, after the order on the left hand, which are more accurately anſwered by the Rules of Practice in the 14th. Chapter, after the order on the right hand.

In a Book printed 1646 page 286, is this queſtion.

If one pound weight of ſmall Ginger coſt 7 d. ½, what will 112 lb. coſt?

Anſwer 3 l. 10 s.

```
  2.3.4.5            7|112
  -------            -----
  3 1 2 5             56
    1 1 2             14
  -------            ----
  6 2 5 0             70 ſhillings
3 1 2 5
3 1 2 5 —3|50000
```

The *Queſtion* thus performed by Decimal Arithmetick in the left hand Margent (as it is in that Book) hath 29 figures, 9 whereof (being more than the operation requires) are ſuperfluous, but take it after the moſt conciſeſt Method *viz.* 7 ½ d. that is 03125 × 112 = 3 l. | 5 primes, and there are as many more figures as there are in the operation on the right hand, which may bee performed far more ſpeedily than the other.

Again, page 288, If an Ell of Holland coſt 3 s. 3 d. what will 343 Ells coſt?

1.2.3.4.

```
   1.2.3.4             4|343
   -------                  3
   1625                -----
    343                 1029
   -------               .85.9
   4575                -------
  6500                 2|111|4
 4875                   -----
 -------                55.14.9
 55|7375
```

In the operation on the right hand are but 22 figures, in that on the left hand 29. and did not the 8th. Rule in Notation of Decimals teach the Learner how to diſcover the value of a Decimal at ſight, the ordinary Method would make the operation more tedious, and the figures requiſite for the reſolution of that queſtion by Decimal Arithmetick would be 43 in number, &c.

Page 289 of the ſaid Book, If a yard of Velvet coſt 15 *s.* 6 *d.* what will 972 coſt ?

Anſwer 753 *l.* 6 *s.*

```
   1.2.3
   -----
    972             972
    775             -----
   -----            486
   4860             243
  6804               24.6
 6804               -----
 -------            753.6
 753|300
```

Several other Examples might be inſtanced out of that Tract.

In a Book printed 1634 page 62.

If 1 yard of Dowlas coſt 1 ſhilling 2 pence 1 farthing, what 375 yards?

```
  .059375        6 |
      375        ─ | 375
  ───────        8 |  62.6.
   296875          |   7.9.3
  415625           ─────────
 178125            2|44|5
 ────────
 22|265625          22—5—3—3
```

Here's 14 figures more in one operation than in the other, and if the decimal fraction were reduced the ordinary way, there would bee 38 figures more in the operation on the left hand, than there are in that on the right hand, which may bee wrought 4 times at leaſt, before the other can bee anſwered once.

In a Book printed 1651, page 120.

If one yard of Lace coſt 1 ſhilling 4 pence 2 farthings, 439 will coſt 30*l.*—3*s.*—7*d.*—2*q.*

```
  .06875       3 | 439
     439       ─ | 146—4
  ──────       8 |  18—3—2
   61875           ────────
  20625          2|60|3
 27500            ───
 ───────          30.3.7d.2q.
 30|18125
```

Page 121. If a Merchant allow his Factor 6 d. 2 q. for Factorage in one pound, it will amount to 33 l. 8 s. 6 d. 1 q. for Factorage in 1345 l.

```
   027083            | 1345
     1345            |  ----
   ------            |  672. 6d. 0q.
   135415            |   56. 0 . 2
  108332             ----------------
  81249              2|72|8
 27083                 ------
 ------                36. 8. 6. 2
36|426635
```

Page 122. If an ℥ of Plate cost 5 s. 4 d. 175 ounces will cost 46 l. 13 s. 4 d.

```
   ......
   266666             4   | 175
      175            --   |  ---
  -------            15   |  43. 15.
  1333330                 |   2. 18. 4
 1866662               ------------------
 266666                 46. 13. 4
 -------
46|666550
```

If the Decimal were reduced after the ordinary Method to finde the value thereof, the operation on the left hand would consist of 40 figures more than that on the right.

Again, in the same page, If a pound of Sugar coſt 10*d.* and 1 farthing, a *C.* weight will coſt 4 *l.* 13 *s.* 2 *d.*

There is a miſtake both in the Anſwer and Operation, which ſhould bee wrought thus.

04270834
112
08541668
04270834
04270834
4|78333408

2
3 | 112
16 | 56
37.4
2.4
2|9|5
4.15.8

So the Anſwer will bee found both waies 4 *l.* 15 *s.* 8 *d.* not 4 *l.* 13 *s.* 2 *d.*

Moore. In a Book printed 1650. Page 103, 104, 105, &c. And in other Tracts are many other queſtions, which may bee far more readily reſolved by the Rules of Practice in the 14th. Chapter: for Decimal Arithmetick is here forc'd beyond its proper end, and ſo doth rather perplex and gravel, than benefit the Learner. I confeſs the ſeven queſtions in Diviſion (which I have purpoſely inſerted to illuſtrate the Rules there) may ſomewhat more ſpeedily be performed by decimal than natural Arithmetick, but queſtions of that nature are very rarely uſeful, and certainly as ſeldome propounded, unleſs to make the Learner dwell long upon a little buſineſs to no purpoſe; but in the 113th. page of the ſaid Book, I finde this queſtion, with which I will conclude (for I might fill a Volume with queſtions of like nature from that and other Books) *viz.*

If a pound of any Commodity or Grocery coſt 1 *s.* 1 *d.* 2 *q.* what will a C. weight of the ſame coſt?

Anſwer 6 *l.* 6 *s.* The Queſtion is wrought in that Book, as it is here in the left hand Margent.

```
'00893) · 1' 125 :: 1.(125' 9809
  1786      893
  3572     ----
           2320
           1786
           ----
(1)        5340
           4465
           ----
(3)        8750
---        8037
 2         ----
           7230
           7144
           ----
           0860
```

```
(1 | 8 |  112
   |   |   14
   |   ------
   |   12|6
   |   ----
   |     6.
   --------

(2)  8 |  112
       |   14
       ------
          126 
```

126 ſhillings, which is know to be 6 *l.* 6 *s.* at ſight.

Here's 67 figures in the operation on the left hand, and in that on the right hand 9 are onely neceſſary, as in the Example wrought the ſecond time, after which order this queſtion may bee wrought 20 times over at leaſt, before it can bee wrought once by Decimal Arithmetick, as that Book directs.

The conciſeſt way that this queſtion can bee performed by Decimal Arithmetick, is that which follows, yet it is far more ſpeedily anſwered by natural Arithmetick.

```
  5625
   112
 ------
 11250
 5625
5625
------
6|30000
```

CHAP. 23.

Of Single and Double Poſition, or the Rule of Falſhood.

1 THe *Rules of Falſe, or falſe Poſition are twofold*, viz. *Single or Double.*

2 *The Single Rule is to bee uſed when there is ſome partition of numbers in parts proportionable*, viz. *A. B. C.* make a purchaſe of 3000*l.* and *B.* is to ſhare double with *A.* and triple with *B.* what are their reſpective ſhares?

		l.	*s.*	*d.*
Anſw.	*A*	333	6	8
	B	666	13	4
	C	2000	00	0

Here nothing elſe is required, than to divide 3000 into 3 ſuch parts, that your ſecond may bee double to the firſt, and the third triple to the ſecond; which that I may do, I ſuppoſe a number at adventure, and double and triple that; and by repeating the Rule of Three, ſo often as there are parts ſuppoſed for the ſhares required, I diſcover the truth, as in the following Example.

Suppoſe *A* 3
B 6
C 18

Total 27 which by the intent of the queſtion ought to bee 3000;

Now by this Poſition I am defective in the truth, yet

l.	*l.*		*l.*	*l.*	*s.*	*d.*
27 .	3	::	3000 .	333 .	6 .	8
27 .	6	::	3000 .	666 .	13 .	4
27 .	18	::	3000 .	2000 .	00 .	00
				3000 for proof.		

As 27. the ſumme of the ſuppoſed numbers is in proportion to 3000 the total of the purchaſe: So are 3. 6. 18. the ſuppoſed parts to the reſpective ſhares 333. 6. 8, &c.

One bearing a bag of money in his hand, was asked how much money was in the bag, hee anſwered, that $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{5}$ made 94 *l.* how much money was in the bag?

Suppoſe 20.

Now the truth may as poſitively bee diſcovered by this poſition (20) as any other, but for avoiding of fractions, it is beſt to ſuppoſe a number, from whence the parts in the queſtion may bee produced in whole numbers, therefore I ſuppoſe 60.

$\frac{1}{3}$ of 60 is 20
$\frac{1}{4}$ of 60 is 15
$\frac{1}{5}$ of 60 is 12

Total 47 which by the queſtion ſhould bee 94.

Therefore—47 . 60 :: 94 . 120. And I do conclude hee had 120 *l*.

$\frac{1}{3}$ of 120 . 40
$\frac{1}{4}$ of 120 . 30
$\frac{1}{5}$ of 120 . 24

94 for proof.

A Graſier ſaid, if hee had as many more Sheep as hee had, together with the half, the third, and fourth part of thoſe hee had, and one overplus, hee ſhould have juſt 630—Now how many had hee?

Subſtract a unite for a time from the given ſumme, and after operation reſtore it again, becauſe unity (one ſheep) doth not riſe and fall proportionably as the fractions do.

Then for Anſwer, if I finde a number, which being twice taken (or doubled) whoſe half, third, and fourth parts thereof will bee 629. I ſatisfie the Queſtion, for adding to it an unite, it makes 630. Suppoſe my number 12 (becauſe it hath the parts required) but then 12 + 12 + 6 + 4 + 3 make but 37, and ſhould bee 629, therefore being defective in the truth, I ſay

$37 \cdot 12 :: 629 \cdot 204$. And for proof.

$204 + 204 + 102 + 68 + 51 = 629$, and then reſtoring the unite (before ſubſtracted) *facit* 630.

It being demanded how many peeces one had in his purſe, he anſwered that $\frac{1}{2}$ $\frac{1}{3}$ and $\frac{1}{4}$ of ſo many as he had, and 100 peeces more would make 300. Now how many peeces were in his purſe

The 100 peeces are to bee ſubſtracted and reſtored, in this, as the unite in the laſt Queſtion.

I put 12 for the Poſition, becauſe it contains the given part.

$12 + 6 + 4 + 3 = 25$, which ought to bee 200, therefore being defective in the truth, I apply my ſelf to the Golden Rule.

$25 \cdot 12 :: 200 \cdot 96$. So I conclude hee had 96 peeces.

$\frac{1}{2}$ of 96—48
$\frac{1}{3}$ of 96—32
$\frac{1}{4}$ of 96—24
104

The 100 peeces firſt ſubſtracted muſt bee added.

Then $96 + 104 + 100 = 300$.

One who had waſted $\frac{2}{3}$ $\frac{1}{5}$ of his perſonal Eſtate had 364 remaining, now what was his Eſtate?

Now for anſwer, ſuch a number is to bee

ſought,

ſought, as will leave 36 remaining, when $\frac{2}{3}$ and $\frac{1}{5}$ are abated.

Suppoſe the Eſtate 15 *l.*

$\frac{2}{3}$ of 15 — 10 } Now 13 from 15 reſts 2.
$\frac{1}{5}$ of 15 — 3 }

Total — 13

which ſhould bee 36. Then $2 . 15 :: 36 . 270$, which was the Eſtate, for $\frac{2}{3}$ thereof 180, and $\frac{1}{5}$ 54 added make 234 — And $270 - 234 = 36$.

When the fraction or parts expreſſed in any Queſtion to bee ſubſtracted exceed an unite, ſo (that in reaſon) it cannot bee ſubſtracted from the poſition or number put, it is an abſurd and impoſſible Queſtion, Example.

Had the former Queſtion been put, that $\frac{2}{3}$ and $\frac{3}{5}$ ſhould bee abated (as it was but $\frac{2}{3}$ and $\frac{1}{5}$) it had been impoſſible for $\frac{2}{3}$ of 15 in the poſition is 10, and $\frac{3}{5}$ is 9. Now 10 † 9 = 19, and how is it poſſible to ſubſtract 19 from 15?

Poſition Double.

1 Double Poſition is uſed when there is no partition in numbers to make a proportion, *viz.* you muſt make a ſuppoſition twice, and if at either time you fall upon a number that will ſatisfie the queſtion, you have performed it, if not, obſerve the errours, and whether they were greater or leſſer than the Reſolution required, and note them with the Characters

of † or — that is, more or leſs, as in the 5th. Rule of the 15th. Chapter.

2 After the errours are ſet down, *multiply them by the contrary Poſitions, and if the errors were both too great, or both too little, ſubſtract both the one product from the other, and the one errour from the other, and divide the difference of the products by the difference of the errors; But if the errors bee of divers kinds, add the products as likewiſe the difference together, and divide the ſumme of the products by the ſumme of the errors, and the quotient gives the number ſought, for the proportion of the errors, is the ſame with the proportion of the exceſſes or defects of the ſuppoſitious numbers, from the number ſought. Example.*

A, *B*. and *C*. determine to divide 100 *l.* thus, *viz.*

B. to have more pounds than *A*. by 3, and *C*. to have more than *B*. by 4. Now how many pounds muſt each have?

For Anſwer, I ſuppoſe
A. ſhall have 33
B.——— 36
C.——— 40 but
33 † 36 † 40 = 109
and ſhould have been
but 100, therefore I
tranſgreſs by an errour of 9 too much

The firſt poſition 33, the 2d. po. 3
Error † 9 Error †
Croſs multipl. 99 product 27
——99
difference of the products 18
9
—3
differ. of errors—6)180 (30

I make my ſecond poſition to be 31. for *A*. *ergo* *B*. 34 *C*. 38, but 31 † 34 † 38 = 103 and ſhould bee but : 100, *ergo* I erre again, 3 too much, therefore multiply croſs-wiſe, and becauſe the errors are both too great, abate both the errors, and products, and according to the Rule divide 180 the difference of the products by 6 the difference of the errors, and you will finde

A. had 30 *l.*
B.——33
C.——37 for 30 † 33 † 37 = 100 And this is the Reſolution when both the errors are too great.

Now ſuppoſe in the ſame Queſtion
A. had —25
B. ergo —28
C. ———32 but
25 † 28 † 32 = 85
ergo the errour too little by 15.

The firſt po. 25 the 2d. po. 27
Error —15 Error—9

Croſs products 225 405
225

difference of products 180
difference of errors 6 (180 (30

Again, I ſuppoſe *A.* 27, then *B.* 30. and C. 34, but 27 † 30 † 34 = 91, too little by 9. And becauſe the errors are alike, I work as before, and finde the ſame Anſwer.

Again, in the ſame Queſtion ſuppoſe
A. ———34
B. ———37
C. ———41 now
34 † 37 † 41 = 112
which ought to be but
ergo too much

The firſt po 34 the 2d. po. 20
Error † 12 Error— 30

Croſs products 1020 ——240 †
† 1020

ſumme of the products —1260
ſumme of the errors 42 (1260 (30

In the ſecond Poſition let *A.* bee 20, *B.* 23, C. 27, but 20 † 23 † 27 = 70 too little by 30, and now ſeeing the errors are unlike, the products and errors are ſummed up, and according to the Rule, the quotient gives 30, as before. And ſo you have this example in all varieties.

Two ſouldiers, *A.* and *B.* receiving 100 *l.* for the ranſome of a priſoner, fell at variance in parting the money, and after each had catched what hee could (upon agreement) *B.* gave *A.* $\frac{1}{5}$ of what hee had ſnatched from him, and *A.* gave *B.* $\frac{1}{3}$ of what hee had ſnatched from him, which done, either of them had 50 *l.* Now how much money did each ſnatch up?

Suppoſe *A.* ſnatched 30, then *B.* caught 70, whereof, when hee gives *A.* $\frac{1}{5}$ (14) A. hath 30 † 14 = 44 then *B.* hath but 56 left, unto which when A hath added $\frac{1}{3}$ of his 30, then hath *B.* 56 † 10 = 66. and A. hath but 34 left, who ought to have 50, ſo the poſition appears defective in the truth by an error of 16 too little.

The firſt po. 30 the 2d. po. 45
Error—16 Error—9

Croſs prod. 270 720
270

difference of products 450
16
9

differ. errors 7 (450(64 $\frac{2}{7}$

I therefore ſuppoſe A. ſnatched 45, then *B.* muſt have 55, whereof when hee gives 11 ($\frac{1}{5}$) to A. then hath A. 45 † 11 = 56, So

B. hath but 44 left, but when *A.* gives him back again 15 ($\frac{1}{3}$) of his 45, *B.* hath 44, + 15 = 59, and ſo *A.* hath but 41 left, and ſhould have 50, therefore this Poſition is defective by an error of 9 too little; and now according to the Rule, I finde *A.* ſnatched 64 $\frac{2}{7}$, *B.* 35 $\frac{5}{7}$ of the 100 *l.*

CHAP. 24.

Of Compound Intereſt and Annuities.

1 Breviate is for the forbearance of monies at 8 and 6 per Cent. per annum for 40 years.

years	*8 per Cent.*	years	*6 per Cent.*
1	1.080000	1	1.060000
2	1.166400	2	1.123600
3	1.259712	3	1.191016
4	1.360488	4	1.262477
5	1.469328	5	1.338225
6	1.586874	6	1.418519
7	1.713824	7	1.503630
8	1.859930	8	1.593848
9	1.999204	6	1.689479
10	2.158924	10	1.790848
11	2.331638	11	1.898298
12	2.518170	12	2.012196
13	2.719623	13	2.132928
14	2.937193	14	2.260904
15	3.172169	15	2.396558

years	*8 per Cent.*	years	*6 per Cent.*
16	3.425942	16	2.540352
17	3.700018	17	2.692773
18	3.999019	18	2.854339
19	4.315701	19	3.025599
20	4.660957	20	3.207135
21	5.033833	21	3.399564
22	5.436540	22	3.603537
23	5.871463	23	3.819750
24	6.341180	24	4.048935
25	6.848475	25	4.291871
26	7.396353	26	4.549383
27	7.988061	27	4.822346
28	8.627106	28	5.111687
29	9.317274	29	5.418388
30	10.062656	30	5.743491
31	10.867669	31	6.088101
32	11.737082	32	6.453386
33	12.676049	33	6.840589
34	13.690133	34	7.250025
35	14.785344	35	7.686087
36	15.968171	36	8.147252
37	17.245635	37	8.636087
3	18.625275	38	9.154252
39	20.115297	39	9.703507
40	21.724521	40	10.285718

2 Breviate is for the forbearance of Annuities at the rate of 8 and 6 l. per Cent. per annum yearly payments for 40 years.

years	*8 per Cent.*	years	*6 per Cent.*
1	1.000000	1	1.000000
2	2.080000	2	2.060000
3	3.246400	3	3.183600
4	4.506112	4	4.374616
5	5.866600	5	5.637093
6	7.335929	6	6.975318
7	8.922803	7	8.393837
8	10.636627	8	9.897467
9	12.487557	9	11.491315
10	14.486562	10	13.180794
11	16.645487	11	14.971642
12	18.977126	12	16.869940
13	21.495296	13	18.882137
14	24.214920	14	21.015065
15	27.152113	15	23.275969
16	30.324283	16	25.672527
17	33.750225	17	28.212879
18	37.450243	18	30.905651
19	41.446263	19	33.759990
20	45.761964	20	36.785590

years	8 *per Cent.*	years	6 *per Cent.*
21	50.422921	21	39.992725
22	55.456755	22	43.392289
23	60.893295	23	46.995826
24	66.764759	24	50.815575
25	73.105939	25	54.864510
26	79.954415	26	59.15638
27	87.350768	27	63.705763
28	95.338829	28	68.528109
29	103.965936	29	73.639796
30	113.283211	30	79.058184
31	123.345868	31	84.801675
32	134.213537	32	90.889775
33	145.950620	33	97.343162
34	158.626670	34	104.183752
35	172.316803	35	111.434777
36	187.102147	36	119.120864
37	203.070319	37	127.268116
38	220.315945	38	135.904203
39	238.941221	39	145.058455
40	259.056518	40	154.761963

3 *Breviate is for the Diſcompt of money at the rate of* 8 *and* 6 *l. per* Cent. *per annum compound intereſt for* 40 *years.*

years	8 per Cent.	years	6 per Cent.
	9259259	1	943396
	8573388	2	889996
	7938322	3	839619
	7550298	4	792093
	6805833	5	747258
6	6301696	6	704960
7	5834904	7	665057
8	5402688	8	627412
9	5002489	9	591898
10	4631934	10	558394
11	4288828	11	526787
12	3971136	12	496969
13	3676978	13	468839
14	3404610	14	442301
15	3152417	15	417265
16	2918904	16	393646
17	2702689	17	371364
18	2502490	18	350343
19	2317120	19	330513
20	2145482	20	311804

Years	8 *per Cent.*	Years	6 *per Cent.*
21	1986557	21	294155
22	1839405	22	277505
23	1703152	23	261797
24	1576993	24	246978
25	1460179	25	232988
26	1352017	26	219810
27	1251868	27	207368
28	1159137	28	195630
29	1073275	29	184556
30	0993773	30	174110
31	0920160	31	164254
32	0850000	32	154957
33	0788889	33	146186
34	0730453	34	137930
35	0676345	35	130105
36	0626245	36	122740
37	0579857	37	115793
38	0536904	38	109238
39	0497134	39	103055
40	0460309	40	097222

A Breviate is for the Diſcompt of Annuities at the rate of 8 *and* 6 *l. per Cent. yearly payments for* 40 *years.*

years	8 *per Cent.*	years	6 *per Cent.*
1	.925925	1	.943396
2	1.783264	2	1.833392
3	2.577096	3	2.673012
4	3.312126	4	3.465105
5	3.992710	5	4.212363
6	4.622879	6	4.917324
7	5.206370	7	5.582381
8	5.746638	8	6.209792
9	6.246887	9	6.801691
10	6.710081	10	7.360086
11	7.138964	11	7.886873
12	7.536078	12	8.383843
13	7.903775	13	8.852682
14	8.244236	14	9.294983
15	8.559478	15	9.712248
16	8.851369	16	10.10589
17	9.121638	17	10.47725
18	9.371887	18	10.82760
19	9.603599	19	11.15811
20	9.818147	20	11.46992

Years	8 *per Cent.*	Years	6 *per Cent.*
21	10.016803	21	11.76407
22	10.200743	22	12.01458
23	10.371058	23	12.30337
24	10.258758	24	12.55035
25	10.674776	25	12.78335
26	10.809977	26	13.00316
27	10.935164	27	13.21053
28	11 051078	28	13.40616
29	11.158406	29	13.59071
30	11.257783	30	13.76482
31	11.349799	31	13.92908
32	11.434999	32	14.08404
33	11.513888	33	14.23022
34	11.586933	34	14.76815
35	11.654568	35	14.49826
36	11.717192	36	14.62100
37	11.775178	37	14.73679
38	11.828868	38	14.84603
39	11.878582	39	14 94909
40	11.924613	40	15.04631

5 *Breviate is for the purchaſe of Annuities at the rate of* 8 *and* 6 *per Cent. per annum yearly payment for* 40 *years.*

years	8 *per Cent.*	years	6 *per Cent.*
1	1.080000	1	1.060000
2	.560769	2	.545437
3	.388033	3	.374110
4	.301920	4	.288591
5	.250456	5	.237396
6	.216315	6	.203363
7	.192072	7	.171935
8	.174014	8	.161036
9	.160070	9	.147022
10	.149029	10	.135868
11	.140076	11	.126793
12	.132695	12	.119277
13	.126521	13	.102960
14	.121296	14	.107585
15	.116829	15	.102963
16	.112988	16	.098952
17	.109629	17	.095455
18	.106702	18	.092356
19	.104127	19	.089621
20	.101842	20	.087184

years	8 *per Cent.*	years	6 *per Cent.*
21	.099832	21	.085004
22	.098032	22	.083045
23	.096422	23	.081278
24	.094977	24	.079679
25	.093678	25	.078227
26	.092507	26	.076904
27	.091448	27	.075697
28	.890488	28	.074592
29	.089618	29	.073579
30	.088827	30	.072649
31	.088107	31	.071792
32	.087450	32	.071002
33	.086851	33	.070273
34	.086304	34	.059598
35	.085803	35	.068974
36	.085344	36	.068395
37	.084924	37	.067857
38	.084538	38	.067358
39	.084185	39	.066894
40	.083860	40	.066461

The five former Breviates for Forbearance of Monies, and Valuation of Annuities, Leaſes, and Penſions, at the rate of 8 and 6 *l. per Cent. per annum*, yearly payments for 40 years, are explained by the following queſtions.

The uſe of the firſt Breviate.

ee the 10th. Queſtion n the 14h. chapter.

What will 25 *l.* for 14 years payable yearly, amount unto, being all forborn or unpaid until the end of the ſaid Term, Intereſt upon Intereſt, being computed at the rate of 8 *per cent. per annum*?

Anſwer 37 *l.* 8 *s.* 7 *d.*

In the firſt Column againſt 14 years, you finde 2.937193, which x 25 the ſumme of money forborn, and ſix places cut off from the product towards the right hand (the ſaid ſumme of money forborn conſiſting but of one denomination) the Anſwer will bee 73.429825 which Decimal Fraction by the 8th. Rule of the 22th. Chapter may bee either diſcovered at ſight, or reduced to 8 *s.* 7 *d.*

What will 25 *l.* 15 *s.* 6 *d.* amount unto, being forborn 22 years Intereſt upon Intereſt, being computed at 8 *per cent. per annum*?

Anſwer 140 *l.* 2 *s.* 6 *d.* $\frac{1}{4}$, &c.

In the Column of 8 *per cent.* againſt 22 years is 5.436540, and the 15 *s.* 6 *d.* reduced to the Decimal 775 by the Directions at the end of the Decimal Table in the 22th. Chapter the work will bee thus.

5.436540

```
        5.436540
          25.575
    ————————————
        27182700
      38055780
     38055780
    27182700
   10873080
   —————————————
   140|126185000
```

25
14
100
25
350

In this Example 9 figures are cut off to the right hand, becauſe the decimal part in the Multiplicand conſiſted of 6 places, and the decimal in the Multiplier of 3.

See the 4th. Example in Multiplicati in the 22th. Chapter.

The uſe of the ſecond Breviate.

What will 17 *l.* Annuity for 9 years payable yearly, amount unto, being all forborn and unpaid until the end of the ſaid Term, Intereſt upon Intereſt being computed at the rate of 8 *l. per cent. per annum*?

Anſwer 112 *l.* 5 *s.* 9 *d.* &c.

In the Column at 8 *per cent.* againſt 9 years, is 12.487557, which x 17, gives the Anſwer as before, A. owes *B.* 748 *l.* to bee paid in 12 years, that is, at the end of each year 62 *l.* 6 *s.* 8 *d.* They both agree to reſpite the payments, till the laſt bee due, that is, until the end of 12 years, and then to pay the whole 748 *l.* with Compound Intereſt at the rate of 8 *per cent, per annum*, what ſumme ſhall A. pay to *B*?

Anſwer 1182 *l.* 18 *s.* 1 *d.*

Take the number in the ſecond Breviate, which anſwers to 12 years for Multiplicand, and reduce 6 *s.* 8 *d.* to a decimal, and add it to 62 *l.* for Multiplier, and the Anſwer will be found as before, *viz.*

The work.

18.977126
62.3333

56931378
56931378
56931378
56931378
37954252
113862756

1182|9068800958

The uſe of the third Breviate.

If 349 *l.* be due to be paid at the end of 5 years, what ſumme of money will pay it preſently, diſcompt or rebate being made at 8 *per cent.* Compound Intereſt?

Anſwer 237 *l.* 10 *s.* 5 $\frac{1}{2}$ *d.* &c

The work.

The number againſt 5 years 6805833
349

61252497
27223332
20417499

237|5235717

There is a Leaſe to be ſold, which after 7 years will be worth 444 *l.* what is it worth in ready money, diſcompting Intereſt after the rate of 8 *l. per cent. per annum?*

Anſwer 259 *l.* 0 *s.* 1 *d.* 2 *q.* &c.

This queſtion is in effect the ſame with the former, for there the queſtion was of a ſumme paid 7 years before it was due, and here of a Leaſe bought 7 years before any profit be received?

The work.

5834904
444

23339616
23339616
23339616

259|0697376

The uſe of the fourth Breviate.

What is the preſent worth of an Annuity

Rent or Penſion of 55 *l.* payable yearly for 31 years accompting Compound Intereſt after the rate of 6 *per cent?*

Anſwer 766 *l.* 1 *s.* 11 *d.* 3 *q.* &c.

Againſt 31 years in the Column
at 6 *per cent.* is 13,92908
55
6964540
6964540
766|09940

There is a Leaſe of certain Lands worth 32 *l. per annum* more than the rent paid to the Lord for it, of which Land there is yet a Leaſe in being for 7 years, and the Leſſee is deſirous to take a Leaſe in reverſion for 21 years, to begin when his old Leaſe is expired, the queſtion is, What is to be paid for this Leaſe in reverſion, allowing Intereſt at the rate of 8 *per cent. per annum?*

There are two waies to reſolve this queſtion, Firſt, you may ſee what 32 *l.* Rent is worth in ready money for 21 years, as if the Leaſe were immediately to commence, and working (as in the laſt queſtion) the Anſwer will bee 320 *l.* 10 *s.* 9 *d.* and becauſe this ſumme of money is paid 7 years before the Leaſe doth begin, therefore I diſcompt the 320 *l.* 10 *s.* 9 *d*, for ſeven years (as is ſhewed in the queſtions upon the third Breviate). and the Anſwer will be 187 *l.* 0 *s.* 7 *d.*

Secondly, You may work it by the fourth Breviate only, for if we firſt ſee what this Rent of 32 *l.* is worth for 7 years, by taking the number which in that Breviate anſwers unto 7 years, which is 5. 206370, and multiply it by 32 (the Rent named) the product will be as you ſee in the firſt Example.

Second add 7 years to 21, and it makes 28 years, then ſeek the number that anſwers to 28 years, which is, 11051078, which x 32 the product will be as in the ſecond work, then take the firſt product from the ſecond, and the remains will anſwer the Queſtion.

The firſt work for 7 years.		The ſecond work for 28 years.
5206370		11051078
32		32
10412740		22102156
15619110		33153234
166603840		353634496
	Subſtracted	166603840
		187|030656

The uſe of the fifth Breviate.

What Annuity, Rent, or Penſion will 766 *l.* ready money buy for 31 years, accounting Intereſt at the rate of 6 *per cent. per annum*?

Anſwer 54 *l.* 17 *s.* 7 *d.* 3 *q.* &c.

The work.

```
   071792
      766
  -------
   420752
  420752
 502544
 --------
 54|882672
```

If the Leaſe of a Houſe or Lands bee worth 153 *l.* fine, and 16 *l.* Rent *per annum* for 31 years, and the Leaſee bee deſirous to bring down the fine to 80 *l.* and ſo to pay the more Rent, the queſtion is, What Rent the Tenant ſhall pay, accounting Intereſt at the rate of 8 *per cent. per annum*?

This Queſtion differs not from the former, if wee do but conſider, that for as much as the fine is to bee leſſened, ſo the Rent is to be raiſed. Take therefore the difference between 153 and 80 the 2 fines named in the Queſtion, by ſubſtracting the one out of the other, and there will remain 73 *l.* The Queſtion then is, What yearly Rent this 73 *l.* will buy for 31 years, take the number in the 5th. Breviate at 8 *per cent.* which anſwers unto 31 years, which is

088107

088107
73

264321
616749

6|431811

And multiply it by 73, the difference of the fines, and the product will bee *6 l. 8 s. 7 d.* &c. the Rent that 73 *l.* will buy for 31 years, which added to 16 *l.* the Rent named in the queſtion, and the Anſwer will be found 22 *l.* 8 *s.* 7 *d.* and ſo much Rent is to bee paid, if your Tenant draw down the fine to 80 *l.*

FINIS.

Books lately printed, and ſold by Thomas Johnſon *at the Golden-Key in St.* Pauls *Church-yard.*

LExicon *Anglo-Latino Græcum Novi Teſtamenti*, or a compact Alphabetical Concordance of all the words of the New Teſtament, with their ſeveral ſignifications, Etymons and derivations, by *A. Symſon*, in *fol.*

Eliſe, or Innocency guilty. A new *Romance* tranſlated into *Engliſh*, by *Jo. Jenning*, in *fol.*

The *Luſiad* of *Portugal*, an Heroick Poem, by Sir *Richard Fanſhaw*, Knight, in *fol.*

Trigonometry, or the Doctrine of Triangles, by the famous Mathematician Mr. *William Oughtred*, in *quarto.*

Hiſtoria Quinq; Articularis, or a Declaration of the Judgement of the Weſtern Churches, and more particularly, of the Church of *England*, in the five controverted Points reproached in theſe laſt times by the name of Arminianiſm, by Dr. *Peter Heylin*, in *quarto.*

Mr. *Richard Baxters* Apology, in *quarto.*

The Beauty of Magiſtracy, or an Expoſition of the 82 *Pſalm*, by Mr. *Thomas Hall.* B.D. Paſtor of the Church at *Kings-Norton*, *quarto.*

The Open Door for mans approach to God,

or